THE ENGINEERING RECORD

Published Weekly by the

McGraw Publishing Company

MAIN OFFICES:

114 Liberty Street, New York.

BRANCH OFFICES:

Philadelphia: 929 Chestnut Street.
Chicago: 1140 Monadnock Block.
Cleveland: Cuyahoga Building.
London Office: Hastings House, Norfolk St., Strand.

SUBSCRIPTION RATES:

United States, Canada, Cuba and Mexico....$3.00 a year.
Foreign subscription .... 6.00 a year.
25 shillings. 25 marks. 31 francs.
Foreign subscriptions may be sent to our London office.

NOTICE TO ADVERTISERS.

Change in advertisements intended for a particular issue should reach the office of The Engineering Record by 10 A. M. Monday of the week of issue. New advertisements can be received up to noon of Wednesday of the week of issue.

NOTICE TO SUBSCRIBERS.

Remittances.—Remittances should be made by check, New York draft, or money order, in favor of The Engineering Record.

Change of Address.—The old address should be given as well as the new, and notice should be received a week in advance of the desired change.

Back Copies.—No copies are kept on sale beyond fifteen months from date of issue, except in bound volumes.

Entered at the New York Post-Office as Second Class mail matter.

Copyright, 1905, by the McGraw Publishing Co.

Of this issue of THE ENGINEERING RECORD, 12,000 copies are printed. Total circulation for 1905 to date, 604,500 copies.

TABLE OF LEADING ARTICLES.

Influence of Shop Methods and Facilities on Design of Structural Steel Work........ 643
American Society of Mechanical Engineers........ 643
Some Features of Hydraulic Engineering........ 644
Fire Protection of Theatres........ 645
Coal Handling Plant at the Hoboken Terminal of the Lackawanna R. R. (Illustrated)........ 646
The Detroit Intake Tunnel 648
The Hydro-Electric Station at Champ. (Illustrated). 648
Surveys for New York State Road Improvements.. 650
The Hydraulic Works of the Chittenden Power Co., Rutland. (Illustrated)........ 653
Steelwork of the Ash Plant of the New York Edison Co. (Illustrated) 655
The Bursting Strength of Reinforced Concrete Pipes. 656
Standard Bearings for Long-Span Plate Girder Bridges, Chicago, Milwaukee & St. Paul Ry. (Illustrated)........ 659
Reconstruction of the Moncrieffe Tunnel. (Illustrated) 660
The Effect of Seepage from Ditches on Stream Flow. 663
A Contractor's Discovery. (Illustrated)........ 663
Ore Handling at Conneaut, O........ 663
A Heated-Piston Engine........ 665
Water Works of Saugatuck, Mich. (Illustrated).... 665
The United States Reclamation Service........ 666
The New Mitsu Bishi Drydock at Nagasaki........ 667
Book Notes 668
Electric Traction in the Simplon Tunnel........ 669
An Unusual Pump. 669
Making an Embankment with a Suction Dredge..... 670
Reinforced Concrete Beams. (Illustrated)........ 670

Influence of Shop Methods and Facilities on Design of Structural Steel Work.

The range in weight and character of structural steel work at the present time is necessarily very wide. It includes not only the greatest chord and web members of the long and heavy spans now being designed and constructed but also a mass of exceedingly light material such as light roof work, railings, and much interior steel work of great variety for buildings. Such an excessive variation in the character of structural steel work necessitates a corresponding range in methods of shop treatment and in the requisite shop facilities.

It might at first sight be thought that the work of a drill or punch would be practically the same, in general character at least, whether the work were light or heavy within a somewhat extended range; or that there might not after all be such a great difference in the forging of eye bars or other members whether light or heavy and so on through the range of all work required in the manufacture of these different classes of structural products. To a certain extent this is true, and yet it fails so completely to harmonize with the actual facts as they generally occur that no designer or constructor of the lighter classes of steel work can possibly afford at the present time to ignore the many radical different elements in the design and construction of light work from those inevitably found in the production of the heaviest building or bridge work.

These differences in shop methods and facilities must be clearly recognized not only for the convenience and rapid output of light work but also for the influence which they exert upon the cost of the finished product. More than one bridge shop in the past has attempted to turn out both heavy railroad work and a lighter class of highway structures but never with satisfactory results. The machines and methods needed for the effective and economical production of heavy work could never be made to turn out light highway work at economical rates, and there were several reasons for the results. A great planer or punch suited for work upon heavy bridge members must be charged with a tool rent which makes a very high rate per pound for the light material. Again, a heavy piece of machinery cannot be manipulated so rapidly for the production of light work as a light tool commensurate in weight with the finished product. Both of these elements of the question make for high final cost of the light work and such results have never failed of realization where the conditions described have obtained. While these observations hold true with different classes of bridge work they gain much additional force when heavy work of one class is compared with light work of another class. Obviously, the shop plant required to construct railings, light interior steel work of buildings, and even light roof work, must be of a decidedly different character from that required in the construction of the ordinary run of bridge work even of light character. There must be an economic fitness between the plant and the product in order that economic results may be obtained.

These considerations affect the design of steel work no less than the cost of production. Essentially the same general reasons for high cost when comparing the machines required to build light work and heavy of similar character are effective for requiring a corresponding care in design. It is an old principle of good engineering design in structural work that the character not only of the main members but especially of details must be such as to be efficiently adapted to the facilities of the shop in which the work is to be done. The early bridge shops of this country were quick to discern that general principle, which was not so promptly recognized, however, by many of the earlier designing engineers. The success of any shop as to economy of output depends vastly more upon the element of suitable design than has frequently been recognized. Every machine is narrowly limited in range to the kind of work which it can perform; indeed, it is generally limited to a single line of work. This, being true of each of an aggregation of machines, necessarily results in a limitation of the kind of work which they can turn out to a combination of the classes of work which each may perform, and that combination like all others has well defined limits which cannot be exceeded.

These general principles have long been recognized in shop administration for the simple reason that every manager is brought face to face with them in the most decisive manner every day of his experience and it would be better in many ways if structural engineers could have shop practice of an extended character before attempting to design work. That observation is just as true of heavy work as of light but it is perhaps particularly true of the great volume of light steel work which is being produced in many shops of the country for a great variety of purposes. It is in an unusual degree essential that such work should be designed with a special view to the character of the machines and their capacities afforded by the shops in which it is to be manufactured. A higher degree of excellence in finish and a much more effective product in resistance and durability can be reached in a well-balanced design governed by these rational considerations, as well as a prompter output and greater economy in cost, that can be attained under any other conditions whatever.

The American Society of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers this week has been a most successful convention from every point of view. The papers have not been particularly noteworthy except the president's address, which, as stated elsewhere, is the most remarkable paper of this kind since the late George S. Morison discussed the new era of engineering at Hotel Pemberton about ten years ago. These annual meetings are not so much for professional discussion, however, as for social intercourse and the extemporaneous debate of subjects brought up at the sessions more on account of their immediate importance than because of a place on the set programme. Viewed in this way the proceedings this week have been very successful, particularly as through the courtesy of the general manager of the Hamburg-American Steamship Co., Mr. Emil Boas, the Wednesday morning session was held on the "Amerika," the magnificent vessel recently added to the fleet of that company. Although flying the German flag she was built at Belfast and is the largest passenger steamer afloat, being nearly 700 ft. long. Her main engines are of about 15,000 h.-p., and she is fitted with innumerable auxiliaries, including passenger elevators. In consequence the vessel is a mechanical marvel and the Society showed its appreciation of Mr. Boas' courtesy by the large numbers who attended this meeting.

The most interesting feature of the meeting from a general engineering standpoint was the annual report of the Council of the Society. It contains a brief reference to the decision of this body respecting the organization of branch sections in districts where there are enough members for the purpose. Each section is allowed to add after its name "Section of the American Society of Mechanical Engineers," if it conforms with certain regulations which the Council has adopted. The American Society demands assurance that the section will be self-supporting and must hold at least six professional meetings during the year, the papers presented at these meetings to be in writing or reported stenographically. All papers before the sections may be presented subsequently at the meetings of the American Society and published in its Transactions, together with such discussion as seems desirable. The Council reserves the right to suspend or disband any section on thirty days' notice. The Society will furnish to its sections copies of professional papers to be read and discussed at their stated sessions. The section must consist exclusively of members of the American Society of Mechanical Engineers. Up to the present time very little has been done in the way of organizing such branches and it will be interesting to learn whether they will meet with the same kind of disapproval that has marked the attempt to form local branches of the American Society of Civil Engineers in districts where there are already well-organized and prosperous general societies. For example, in Pittsburg there is a very strong organization with a mechanical engineering section where valuable papers are presented; the reception which the proposition to form a local branch of the American Society of Mechanical Engineers will receive in Pittsburg is consequently worth watching. In a city like Boston, where there is already a very strong local organization of civil engineers exclusively, a section of the American Society of Mechanical Engineers might well be formed. It is hardly necessary to go into this matter at much length now, as the opinions of this journal concerning it have already been expressed a number of times.

The membership of the Society has been steadily increasing, there having been over 300 new members elected during the past year. The Society has unquestionably gained much prestige through its association with the American Institute of Electrical Engineers and the American Institute of Mining Engineers in the construction of the Union Engineering Building, now progressing in a manner that satisfies the most exacting critic. The growth of the Society, like the unparalleled growth of the American Institute of Electrical Engineers, is in a sense a rather interesting commentary on the proposition which will be discussed at the forthcoming annual meeting of the American Society of Civil Engineers. It has been formally proposed that the constitution of the latter organization shall be so changed as to make mechanical engineering, electrical engineering, mining engineering, and other specialties, branches of civil engineering, so far as a definition in the constitution of the civil engineering society can settle the matter. This is one of those subjects that produce more or less ill feeling when discussed, without accomplishing very much good in the end. If the American Society of Civil Engineers chooses to change its constitution so that civil engineering is defined in that document to include mechanical, electrical and other branches of the profession, it has a perfect right to do so. Judging from the strong private criticism that has already been made against the proposition by mechanical and electrical engineers who are members of the American Society of Civil Engineers the proposition will not be carried except under strong protest. There are many mechanical, electrical and mining engineers who take great pride in their professional work. They do not care to be considered civil engineers in any modern sense of the term and look on the attempt to classify them as such in much the same light that the general public would regard an attempt by the authorities of Massachusetts to enforce all the old Puritan blue laws which have never been revoked, but have long since passed into dusty oblivion. These men argue that it would be as right to restrict the use of the name engineer to the artillery men of our army, since their work is nearest the equivalent of the work of the men who were first called engineers, as to spread the mantle of civil engineering over all engineering. The attempt to make civil engineering comprehensive in its scope, while unquestionably looked upon with favor by many eminent engineers engaged in municipal, railway and structural specialties, has another side which must be considered. An examination of the transactions of the American Society of Civil Engineers for recent years, exclusive of the volumes of the International Engineering Congress, shows that there is practically nothing in them for electrical, mining and mechanical engineers. Consequently there is some good reason for the opposition that will be exerted against the proposed change in the constitution of the American Society of Civil Engineers.

Some Features of Hydraulic Engineering.

Elsewhere in this issue there are three papers which are deserving of special attention on account of the manner in which they bring out certain important features of hydraulic power development. The first of these is Professor Steens's article on the Champ power plant near Grenoble, France. This development is not new, but the very fact that it has been in operation for a number of years makes it particularly deserving of comparison with the experiments described in the article on the bursting strength of reinforced concrete pipe. These experiments were made by the engineers of the United States Reclamation Service. That service has to construct many aqueducts, some of large size and frequently flowing under high heads. These aqueducts present difficult features on account of their remoteness from a base of supplies, and also because in many cases they must be built across alkali plains where wood and steel are more or less subject to severe corrosion. In consequence the engineers have made an investigation of the bursting strength of reinforced concrete tubes of large diameter. These were made with great care in Los Angeles and apparently were of better character than the ordinary run of American concrete work. Nevertheless the experiments indicated that such a system of construction is not satisfactory for pipes under considerable heads. The result of these investigations should be compared with the actual service of the large reinforced concrete conduit of the Champ power development. This conduit is about 11.8 ft. in diameter and in places runs under a head of over 65 ft. It is not only subject to a static head, but is also exposed to the severe fluctuations in pressure due to the changes in load at the station, a kind of shock to which the conduits of the Reclamation Service would probably not be subjected. Nevertheless this long line of reinforced concrete pressure pipe has been working satisfactorily, and proves by the experience of many months that it is possible to construct such a conduit in spite of the adverse indication of the Los Angeles experiments. In looking about for an explanation of this feature of American experiments to agree with European practice it may be well to consider that a high grade of concrete has been used in Europe for many years, while in the United States the same quality of concrete is really a comparatively new thing. Not so many years ago good Portland cement was very expensive, natural cement was not always made on honor, and concrete in consequence failed to be appreciated by American engineers. On the contrary in Europe the material was in high favor, owing to the low wages paid for labor requiring little skill, and the art of concrete construction had been brought to a high state of development. There were many contractors perfectly willing to build concrete work in Europe under guarantee that it would be practically impervious to water fifteen years ago; at the present time there are very few contractors who would undertake such work in the United States, and there are very few engineers who would feel warranted in asking them to do so at any price. Of course such concrete will sweat more or less, but where the water carries silt in suspension, as does the Drac, which furnishes water to the Champ plant, the pores which permit this sweat gradually fill up and the conduit becomes tight. Doubtless this water-tight work would not be looked upon with such grave objection by American engineers had they the benefit of the long experience of German and French practice with concrete construction to prove to them that practically water-proof concrete can be made provided due care is used in the selection and manipulation of the materials and in the subsequent curing of the concrete.

Another feature of this French installation, which is of interest, is the provision of three standpipes along the line, two on the reinforced concrete section and one on the riveted steel section, which serve as reliefs against the effects of water hammer. The surging of water in these long pipe lines is a matter that has been so thoroughly discussed in Miss Simin's paper before the American Water Works Association last year that there is hardly any reason for failing to provide for such phenomena. Until the publication of that paper very little information was available to American engineers concerning the real nature of hydraulic shock, but at the present time that information is available and it is safe to say other standpipes, or some other form of relief will be used more frequently than in the past in order to protect conduits as well as the power plant. It will be noticed that the standpipes used in the French plant are small, graceful towers, resembling self-supporting chimneys. A structure answering the same purpose, but of wholly different appearance, is shown in the article on the hydraulic works of the Chittenden Power Company, which also appears in this issue. That relief pipe rises in a tank of the well-known form built by the Chicago Bridge & Iron Works. It will be noticed that this form of construction is necessary in order to prevent freezing. At the Chittenden plant the standpipe itself and the tank at the top of the tower into which the pipe discharges are both protected against the cold by steam coils, and it seems hardly possible that any trouble should arise through the formation of ice, which of course is a great source of danger to a standpipe of this nature in a Northern climate. A comparison of the two forms of construction is afforded by the illustrations in the two articles, and it will be noticed that the two systems of design afford means of satisfaction to every problem which a relief pipe of this nature presents.

The Chittenden power plant is of interest on account of the extraordinary storage capacity of the two reservoirs furnishing the water. These basins have been so designed that they practically furnish storage for all the rainfall of a territory of 24 square miles. The interesting feature of the system is that for the present, while the demands for power are not large, a reservoir about a mile and a half from the power station and 222 ft. above it is ample for all requirements. At a later date a reservoir five miles farther up the stream will enable a great deal more water to be furnished under a head of nearly 700 ft. At the present time the construction of this long and expensive pipe line from the upper reservoir is not warranted by the demands for power and consequently the stored water in this basin is discharged, as noted, down the entire channel of the stream into the lower basin. Probably this is one of the most unusual systems of developing a watershed that has been constructed in New England. Just how far the expectations of the designers as to the amount of water available from the drainage areas will be satisfied by the actual run-off remains to be settled by experience. The discharge of such rough catchment areas is a pretty uncertain quantity, and it will be interesting to learn how much water these great basins actually hold from year to year. Experience in California has shown that not rarely reservoirs are constructed much larger than the actual available run-off warrants, and there are some imposing dams in that State which have never yet had water behind them that even approached the level of their crest.

Fire Protection of Theaters.

In The Engineering Record of November 25, reference was made to the recent British criticism of presidential addresses before engineering societies. It was pointed out that the president of one of these great organizations was chosen to his high office in recognition of eminent ability along some special line, and that in consequence it was desirable for his presidential address to cover that particular specialty. Mr. John R. Freeman has followed this idea in his address before the American Society of Mechanical Engineers this week, which is of exceptional interest to the public and of great technical importance. He chose for a subject the safe-guarding of life in theaters, on which he can speak with the authority that comes from a lifetime of study of fire protection and fire-resisting construction. In the introduction of his paper he pointed out that the protection of theaters against fires was far behind protective measures used in industrial plants, and that this condition was a wrong against the public that should be righted at once. In his opinion, safeguards, to be ample, are mostly simple, and the main features of many of them have already been worked out and tested in theaters and shops. The additional safeguards which must be worked out for theater purposes, automatic smoke vents, a safe proscenium curtain, a safe method of warming and ventilation, and proper arrangement of automatic sprinklers on the stage and in dressing and storerooms, are all problems that do not impose a great strain on engineering ability. Mr. Freeman pointed out that the subject was one eminently fitted for the consideration of engineers because a precedent was afforded by the official investigation made by the Austrian Society of Engineers after the burning of the Ring Theater in Vienna, the results of which were republished by that organization after the burning of the Iroquois Theater.

In his paper Mr. Freeman pointed out features in which the experience gained in fire protection engineering in other classes of buildings can be applied in theaters. The need of such application of experience is thoroughly shown by some of the facts mentioned. For instance, he mentions seeing in one of the best New York theaters a wedge-shaped space beneath the sloping floor of the auditorium used as a plenum chamber for ventilation employed also as a store-room for trunks and properties. This resulted in a fire risk of the worst character. He also mentions finding in one of the most famous American auditoriums that the portable wooden flooring sometimes used to transform the main hall into a ballroom stored in a dark passageway forming the main air chamber between the heating coils and concert hall. This flooring was thus kiln-dried to perfection and ready to be burned at the slightest provocation.

Any one who has visited theaters, even the best of them in our largest cities, does not need printed statements to recognize the gravity of the slip-shod, reckless management of such buildings. For some reason or other the precautions against fire which are taken in theaters are perfunctory and the lesson of the Iroquois fire seems to be wholly unlearned by managers generally. Mr. Freeman well says in the close of his address that what is necessary is a law emphasizing fire prevention by inspection rather than a law that mentions various things theater managers shall not do. The affirmative legislation is always stronger than the negative, and this point brought out in the paper deserves careful thought.

The value of the paper in some respects is made particularly strong by the astonishing information it contains concerning many of the constructions and materials relied upon for fire prevention in theaters. The statements concerning smoke vents show that some of the designs that as copies are entirely satisfactory are really of little use owing to defective details. The experimental results reviewed in this portion of the paper are particularly valuable, not only because the importance of these vents in theaters is very great but also because similar smoke vents must be installed in the buildings for certain industrial purposes and the information in the paper is correspondingly valuable to mill architects.

Automatic sprinklers for theater use Mr. Freeman ranks as second in importance only to smoke vents, although probably very few of them have ever been installed in such buildings. He discusses the method of using them and the possibility of damage through leakage of some of the sprinkler heads, and makes a very strong plea for their installation.

A third precaution which demands study is the curtain for closing the proscenium arch. This portion of the paper is one which will attract very wide attention. In addition, the materials and construction of such curtains are gone into at length and the conclusions reached by Mr. Freeman from careful tests of curtain material, and an examination of curtains in theaters where there have been fires leads him to the conclusion that a great deal is to be learned concerning this detail of theater appointments. This part of the paper is so important that further reference to it is deferred until a subsequent issue. The fireproofing of scenery is also discussed at length, and it is evident that Mr. Freeman does not put very much reliance on chemical treatment for preventing fires; the most the treatment will do is apparently to retard the process of catching fire. The paper closes with a discussion of fire-escapes and fire extinguishers. Most of the latter materials seem to be common cooking soda more or less doctored with pigments in order to change their color and sell at prices far above the commercial value of the materials used.

The paper as a whole is one of the most important ever read before an engineering society, as the above notes on its contents indicate. It is satisfactory to observe that Mr. Freeman has stuck to his last in preparing his address with a consequence that a real contribution to technical knowledge has been produced, just as was the case with the presidential address of Mr. Schneider before the American Society of Civil Engineers last summer. If these two happy precedents are followed in the future it is safe to say that the presidential address instead of being a bore to prepare and an infliction to listen to will become one of the great features of the engineering year.

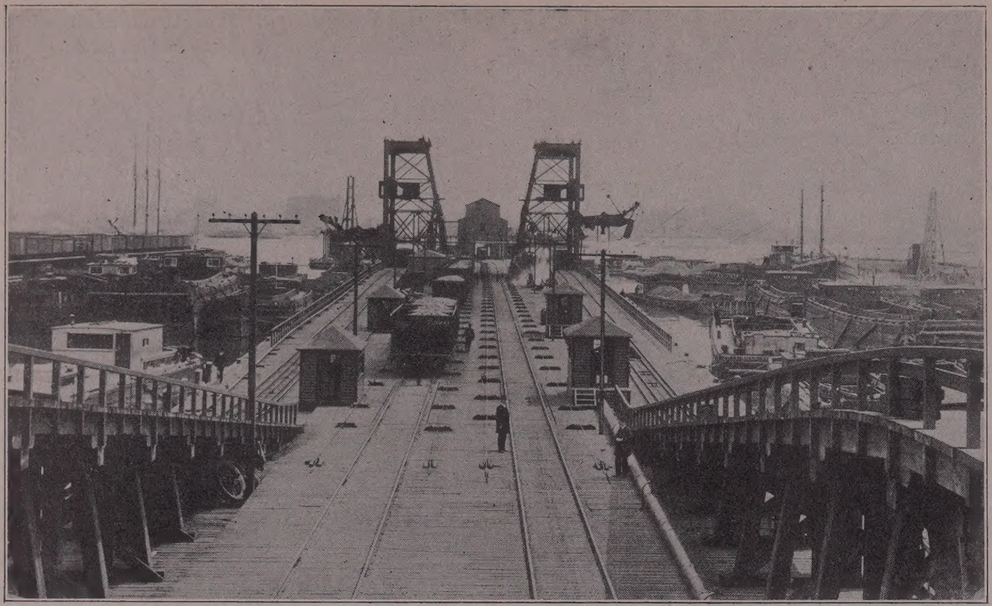
Notes and Comments.

THE GREAT ROAD IMPROVEMENTS for which the people of New York State recently authorized an expenditure of $50,000,000 are already causing a controversy between the advocates of different plans for spending the money. Two main roads across the State are being discussed, one from Albany along the Mohawk valley, and the other through the southern tier of counties, following the New York and Chicago route favored by automobile interests for several years and already developed to some extent. Both projects have strong advocates, but whether either should be carried out in toto by State aid depends on the absence of a more meritorious use of the money for the construction of short sections of model highways in districts where such roads would prove valuable object lessons. Such roads, a few miles long, generally lead to the construction of large extensions of them without State aid, which is really the main object of such aid.

THE FABRIANO VIADUCT, recently completed by Marcelle & Co., of Bologna, is a very graceful example of reinforced concrete highway bridge construction. It consists of two central arches of 84.9 ft. span and 26.9 ft. rise and two side arches of 30.2 ft. span and 13.1 ft. rise. The total length of the bridge is 354 ft., and it carries two 3.9-ft. footwalks and a 23-ft. roadway. Each span has three arch ribs. The central rib is 5.91 ft. wide at the springing and 4.59 ft. at the crown, while these widths in the two face ribs are 4.59 and 2.95 ft., respectively. The ribs are connected by latticed braces and are 3.28 ft. thick at the springing and 1.97 ft. at the crown. They are rigidly connected with the reinforced concrete abutments and piers. On the ribs are 1.97 x1.97-ft. columns 7.87 ft. apart on centers ending at the top in a sort of architrave carrying the brackets on which the footwalks are supported. Small arches 6 in. thick are turned between the architraves to support the roadway.

THE DESIGN OF CULVERTS does not end when their cross-section has been fixed; in fact, the computation of the strength of the walls and arch is the most elementary part of the culvert problem. The judgment of the engineer is shown in the provisions he makes for bringing the water to the culvert and taking it away from the other end. What is meant can be best indicated by referring to bad examples in a recent stretch of road construction in Massachusetts. The culverts are good enough in themselves, but located in pockets in the drainage lines. The consequence is that they become choked with sand after every heavy rainfall and are put out of commission entirely, thus becoming worse in their efficiency than culverts of too small cross-section. It must be borne in mind that the culvert is probably the most troublesome type of waterway an engineer has to design, for its success will depend on judgment in the choice of all its features and theory can offer very little assistance.

STREET RAILWAY TRACKS that deserve to be watched with considerable attention by municipal authorities have recently been laid in Battle Creek, Mich. The rail is a 7-in., 70-lb. T section laid on 6x8-in. white oak ties placed on 2-ft. centers. Suspended joints are used. The ties were well ballasted with gravel, brought up to within 11 in. of the street surface. The two joint ties were bedded on a block of concrete 8 in. thick, and concrete of the same thickness was placed under the ties supporting all special work. The street pavement rests on 6 in. of concrete and a 1-in. cushion of sand. Nelsonville paving blocks were used and special fillers and stretchers were used along the rails, leaving a wide groove inside each rail, instead of the little slit of a grooved rail. This construction seems to be favored by drivers, as the easy slope of the groove makes it easy to leave the latter. The construction is better for the railway because the wheel bearing comes directly over the center of the rail base and the groove is self-cleaning. The results of experience with this track deserve watching because the grooved rail is actually becoming a dangerous factor in high-speed electric traction, making it impossible to use wheel flanges large enough for their important duties.



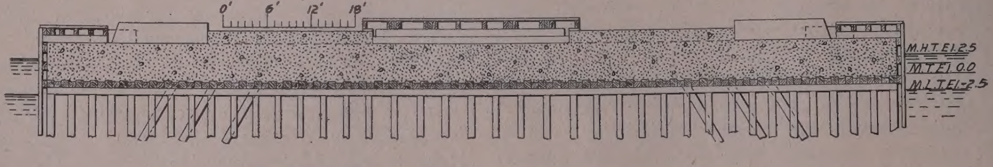
Looking toward the Dumpers from the Bridge between Light-Car Tracks.

COAL HANDLING PLANT AT THE HOBOKEN TERMINAL OF THE LACKAWANNA R. R.

The Delaware, Lackawanna & Western R. R. has installed two McMyler car dumping machines in its terminal yards at Hoboken, N. J., which are the only machines of this type in operation at tide water. A large amount of the heavy coal traffic carried by the Lackawanna from the anthracite coal fields of Pennsylvania is brought to its eastern terminus at Hoboken. From the terminal the coal is carried by various types of water craft to all parts of New York harbor, and in long tows to places along the coast, particularly to Boston. The Lackawanna has an extensive terminal area at Hoboken, but the heavy traffic that is tributary to it keeps its facilities congested at all times and requires every possible economy of space in order that this traffic may be handled properly. The two car dumpers, the arrangement of the tracks which serve them and of the loaded-car and light-car yards built in connection with them permit a much greater amount of coal to be handled than could be taken care of on any type of gravity-dumping piers occupying the same space.

The car dumpers are on a pile and timber pier, extending 1,270 ft. into the North River from the bulkhead line. They are built on a heavy concrete base erected on a pile foundation, the transverse center line of the base being 645 ft. outside the bulkhead line. The pier is cigar-shaped in plan, 60 ft. wide at the outer end, 116 ft. wide at the center line of the dumpers, and 72 ft. wide at the inner end. The general arrangement of the dumpers and the tracks which serve them is shown in the accompanying illustrations. An arrangement of grades on these tracks, together with a system of cable haulage, are employed which avoids any necessity of locomotives on the pier. This greatly facilitates the handling of cars, and at the same time permitted a more suitable lay-out of the car storage yards used in connection with the dumpers.

The loaded-car storage yard has a capacity of 500 cars and is immediately back of the shore end of the pier. It has 14 tracks and is laid out symmetrically on each side of the projected center line of the pier, with a diagonal ladder track on each side of the yard. The ladder tracks join a track on each side of the center line of the yard, these two middle tracks being continued out on the pier. The yard is laid out for gravity operation, its tracks all being on a 1.33 per cent. descending grade approaching the pier. This grade is maintained to within 50 ft. of the bulkhead line, where it is reduced to 1.0 per cent., the tracks descending at that rate for about 95 ft. out on the pier. One of these tracks is on each side of the transverse center line of the pier. A 44-ft. car-weighing scale, with its transverse center line 135 ft. from the bulkhead line, is placed in each of these two tracks leading in from the loaded-car storage yard. Between the shore end of each scale and the outer end of the portion of these tracks on the 1.0 per cent. grade the track grade is gradually reduced until the tracks become level. This arrangement of grades reduces the speed of the cars dscending by gravity from the storage yard until they pass over the scales slowly enough to be weighed while moving and then come to a stop just beyond the scales.



Cross-Sectional Elevation of Concrete Base for Car Dumpers.

The two loaded-car tracks are level for 400 ft., from the end of the scales nearly to the outer end of the dumpers. Provision is thus made for the temporary storage of several cars on each track, avoiding any delay in the supply of cars to the dumpers. After the cars lose their momentum and come to a stop on the level track beyond the scales they are handled over the tracks on the balance of the pier by cable haulage. A short piece of cable, with a grip on one end by which it is attached to the haulage cable and a hook on the other end which may be attached to any of the projections on the side of the car, is used in moving the cars.

Just beyond the dumpers a turnout connects each of the loaded-car tracks with a track parallel to it along the outer edge of the pier. Each of the loaded-car tracks is on an ascending grade for about 100 ft. from the end of the level stretch in it at its dumper. The turnouts are also on a descending grade which is increased to 1.4 per cent. The tracks wtih which the turnouts connect on the outer edges of the pier end about two car lengths beyond these connections, their rails being curved up nearly to the vertical at the end to prevent cars from running over. This arrangement of the tracks supplying the dumpers with loaded cars makes the handling of the latter comparatively easy. After the cars have been weighed and have come to rest on either of the level tracks between the dumpers and the scales they are moved along by attaching one of the pieces of cable, with a grip on one end and a hook on the other, to either of the haulage cables on each side of the track and to the car. The haulage cable on the outside of both loaded-car tracks ends at the dumpers. One of those on the inside ends just beyond the dumpers, but the other one continues to the end of the pier. The cars get sufficient momentum from the haulage to carry them to the beginning of the grade at the dumper and then continue by gravity on the turnout to the end of the outer tracks. This outer track on each side of the pier ascends on a 1.4 per cent. and then a 4.23 per cent. grade to the dumper it serves. The cars are pushed up this grade to the dumper by a heavy four-wheeled haulage car which runs on rails gauntleted between those of the standard-gauge track. This haulage car when at rest is against a bumping block in a depression at the end of the track and is attached to a cable operated on drums in an engine room under the dumpers. It is manipulated by a man in a house on the tower of the dumper, a counterweighted tail rope being required to bring it back to position in the depression.

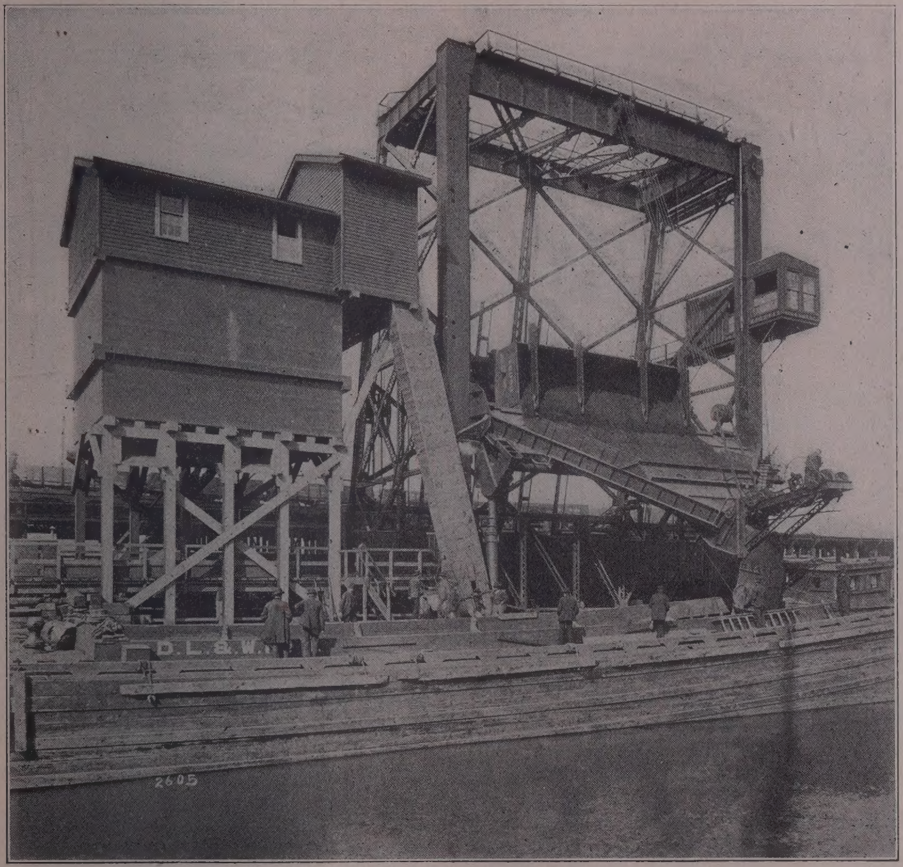
The general appearance of the dumpers may be seen from the accompanying illustrations, which also show the lay-out of tracks that serve them. The view looking toward the dumpers from the end of the pier shows the continuation of the two straight loaded-car tracks, the turnout from each of them to the outer tracks, directly serving the dumpers, and these latter tracks rising to the dumpers. Each dumper consists essentially of a tall steel frame-work which rests on the heavy concrete base and carries a car elevator platform, or cradle. The cradle carries rails on top that are part of the track leading up from the turnout connection with the loaded-car track and may be raised and lowered by cables which support it. The haulage car at the end of the turnout pushes the car of coal up on the track on this cradle. The first upward motion of the cradle brings into action heavily weighted cams beneath its floor which move the upper part of it, the track and car about 2 ft. toward the outer edge of the dumper. This places the side of the car against strong guide posts on that side of the cradle which are vertical when the cradle is in its normal position. The edge of the car comes under horizontal arms on these guides at the same time.

When the top edge of the car reaches the level of the edge of a concentrating pan on the water side of the dumper the cradle is revolved on its outer edge, revolving the car with it, the extreme revolution being 135 degrees from the horizontal. The car is prevented from falling out of the cradle by the guides on the side of the latter. A chain is fastened at the bottom of each of these guides and extends up on the outside of them, the guides being hinged at the bottom. Each chain is connected at the top to a wire cable that passes over a pulley at the top of the dumper framework and carries a heavy counterweight at the other end. As the cradle and car revolve the top of the latter comes against the guides and throws them sufficiently out of the vertical plane to bring the counterweights in action.

The concentrating pan is hinged at the edge along the dumper, where it is attached to the frame-work. It is supported at the outer end by an eight-part tackle rove with a wire cable with one end fastened to the top of the steel frame and the other end around a drum in the engine room. An adjustable screen is placed in the bottom of the pan, and beneath this screen is a screw conveyor which carries the screenings to a spout at one end. The rate at which the coal is dumped from the car depends on the amount the car is tipped, and is regulated according to the condition of the coal, that is, whether it is fine or coarse and wet or dry. The operation of the cradle and pan is controlled by an operator in the house on the frame-work, who regulates the rate of dumping so the coal may be properly screened and breakage prevented.

The end of the concentrating pan may be raised and lowered by the tackle which supports it. A square, sheet-steel, telescopic discharge chute carried on the end of the pan may be varied in length to considerable extent. This chute is manipulated by an electric motor controlled by an operator who stands on a platform around the top of the chute and is in full view of the coal in the concentrating pan and that in the vessel. He can vary the position of the end of the discharge to suit the stage of the tide, the size of the vessel that is being loaded and the height of coal in the latter. In this way the drop of the coal from the car to the hold of the vessel is reduced to a minimum.

The spout at the end of the screw conveyor under the screen in the concentrating pan is telescopic and changes length as the pan is raised and lowered. It is connected at the bottom to the boot of a bucket elevator, built by the Link Belt Machinery Co., the elevator discharging at the top into a storage pocket built beside the dumper. A weighing device is installed in this pocket, so the amount of screenings removed from the coal placed in a boat may be determined at once, and from this and the car weights the exact amount of coal put in the boat may be determined as soon as the last car consigned to it is dumped. The screenings pocket dumps into a car on the track beneath it, or into a boat beside the pier.


A Car Partially Turned Over in the Dumping Operation.

When the coal has all been dumped from a car the latter is righted in position again and the cradle lowered to the track level. The next loaded car pushes the empty car off the dumper and the dumping operation is repeated. The dumping of a car from the time it reaches the dumper until it leaves the latter requires on the average about 2 min. The dumper can handle all sizes and types of cars in service in the coast trade and has a capacity of handling a load of 160,000 lb., comprising a car and its contents. Under normal operating conditions each dumper handles about 600 tons an hour, but as high as 8,000 tons have been handled in 10 hr. by each machine. Two steam winches to each dumper greatly facilitate the handling of scows along the pier.

The track on which the empty cars leave the dumper is laid on a 1.0 per cent. descending grade for 465 ft., the cars operating by gravity on it. A track scale, 44 ft. long, is placed with its transverse center line 125 ft. back from the end of this grade and the empty cars are weighed in passage. At the end of this descending grade the track begins to rise on a trestle until it is finally ascending on a 16 per cent. grade, the total length of the ascent being 145 ft. At the summit a descent is commenced on a grade which reduces from 2 to 1.33 per cent., and continues several hundred feet to a light-car storage yard.

The light cars are hauled up the 16 per cent. grade by a four-wheeled haulage car, one on each track, which is operated the same as those which push the loaded cars on the dumpers. Each haulage car is in a depression under the track which it serves and beyond the track scale, where it remains until the light car has passed over it. It is attached to a cable on a drum in an engine room beneath the summit of the trestle. It is controlled by an operator in a house on a bridge between the trestles carrying the light-car tracks of the two dumpers, and spanning the two loaded-car tracks. The light-car tracks leading from both dumpers have the same arrangement. The one from each machine discharges cars into a light-car storage yard, one of these yards being on each side of the loaded-car storage yard.

One of the illustrations is a view looking from the bridge between light-car track trestles toward the dumpers and the outer end of the pier. It shows the two loaded-car tracks leading in from the storage yard, the track scale in each of these tracks and the cable haulage on each side of the tracks. The light-car tracks from the dumpers are shown on either side of the pier. The right-hand loaded-car track may be seen to be extended to a coal pocket at the end of the pier, its haulage cable also being extended. This coal pocket has a capacity of 1,800 tons and supplies fuel to boats in the harbor. An 8x10x22-ft. steel hopper is placed beneath the track at the entrance to the pocket. The cars discharge into this hopper, which had to be made watertight, as its bottom is 1 ft. above mean high tide. A bucket elevator raises the coal from the hopper to a flight conveyor, which discharges it into various bins. The discharge spouts of the bins empty in weighing hoppers on wheels on a dolly track parallel to the sides of the building, the hopper discharging into the bunkers of the vessels.

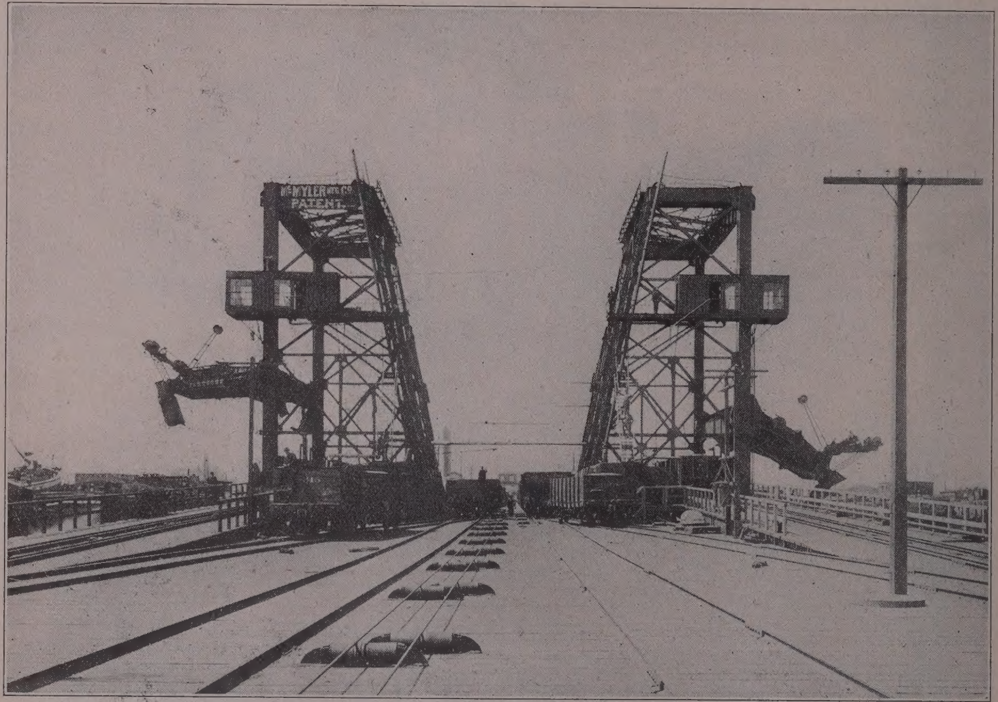
The drums of the cables of the haulage cars, those of the endless cables serving the loaded-car tracks and the operating machinery of the dumpers, with the exception of the electric motors on the spouts of the concentrating pans, are operated by steam engines. Steam is supplied through a 12-in. main by a boiler plant in a central brick station building at the shore end of the pier. This station contains four hand-fired, 256-h. p., water-tube Stirling boilers. An addition is being added to the station building and two more boilers of the same size are being installed. A 500 and a 750-gal. fire pump is installed in an engine room adjoining the boiler room. These pumps furnish water for fire protection to the terminal yards and structure, and will be supplemented by the addition of other pumps. A storage bin is built under the light-car track next to the power house near the summit of the trestle carrying it at that point. An opening is made in the track structure so coal may be discharged from bottom-dump cars into the bin. One side of the latter is the side wall of the station building and doors connect it with the firing floor of the boiler room.

The pier carrying the dumpers and the tracks serving them is built in 10 to 25 ft. of water. The bottom of the river is a soft silt to a depth of 60 to 130 ft., with a layer of sand and gravel underlying the silt. This condition, together with the peculiar shape of the pier and the heavy footing required for the dumpers, made the construction quite difficult. The pier contains 117 transverse pile bents, most of which are on 12-ft. centers. Owing to the differences in length of practically every bent, except those toward the outer end, and to the various grades in the tracks on the pier, most of the bents have different details, although a general method of construction was followed in building all of them.

The two dumpers and their operating machinery are carried on a concrete base, 81.5x116 ft. 8 in. in plan and with an average thickness of 5 ft. This base is built as a monolith, without any reinforcement, and is laid directly on a tight timber floor placed on caps on piles. There are 1,080 piles under the floor, which are cut off at mean low tide and capped with 12x12-in. timbers on the transverse bents. Over the caps is laid the tight floor made up of 10x12 and 12x12-in. longitudinal timbers. The load on the base is about

1,000 tons, largely concentrated on the legs of the dumpers toward its outer edges. The live loads on the base are such as to subject the concrete to considerable shock and vibration, but after two years of service no cracks have developed in it. The whole base has, however, settled perceptibly since it was built at gradually diminishing rates until settlement has now practically ceased.

The plans for the pier on which the coal dumpers are built and the arrangement of the tracks which serve them were developed under the direction of Mr. L. Bush, chief engineer of the Delaware, Lackawanna & Western R. R., by Mr. Geo. T. Hand, assistant engineer. The pier was built under the immediate direction of Mr. J. E. Snell, superintendent of buildings and docks of that railroad, and its operation is under his supervision. The McMyler Mfg. Co. built both of the coal dumpers. One of them was installed by the Dodge Coal Storage Co., as eastern representative of that company. The other was installed by the McMyler Mfg. Co.



Looking Toward the Dumpers From the End of the Pier.

The Detroit Intake Tunnel.

The new intake tunnel of the Detroit water-works was begun on June 13 of last year by the C. H. Fath & Son Construction Co., of Cleveland, and the last drive was made on April 1, as recorded in this journal at the time. The distance from the center of the shore shaft to the center of the intake crib is 3,149½ ft. The work has been done under the direction of Mr. Clarence W. Hubbell, civil engineer of the water board, who gives the following notes concerning it in an annual report that recently appeared.

The excavation was 13 ft. in diameter, and the material a tough blue clay with occasional small pockets of sand and gravel. Both the character and condition of the soil throughout the entire distance checked very accurately with the borings. The entire tunnel was driven from the shore end, and no shield was used on the work.

The air pressure required at the start was from 10 to 12 lb. This was gradually increased as the material became softer until it reached 25 to 28 lb. at the outer end of the tunnel. At this point the water was 30 ft. deep and the roof 26 ft. thick. The highest pressure was 33 lb., necessary on Dec. 15 on account of treacherous ground.

Sunday was usually used by the contractor for cleaning up, and repairs to the plant. During the other six days of the week work was carried on continuously 24 hours per day. Two 8-hour shifts of miners were alternated with one of masons.

Every possible precaution was taken to insure the health and safety of the men engaged on the work. A physician was appointed under the direction of the Board of Health to examine all men working under air pressure, and to advise on sanitary questions. Special attention was given to the problem of ventilation, the purity of air in the tunnel being maintained at a higher standard than in many of the public schools in the city. The tunnel was completed without any serious accident, and without the loss of a single life.

The length of tunnel completed each month is given in the following table: June 13 to July 31, 1904, 200 ft.; August, 297 ft.; September, 354 ft.; October, 408 ft.; November, 403 ft.; December, 333 ft.; January, 1905, 454½ ft.; February, 415 ft.; March, 301 ft.; April (one day), 10 ft.; total, 3,175½ ft.

There was some delay during the first few weeks caused by the slow delivery of brick and also on account of the time required to install the air lock. The most rapid progress was made during the month of January, when the weather conditions were very severe.

The Hydro-Electric Station at Champ.

By A. Steens.

The hydro-electric station at Champ has been built to furnish electricity for motive power in various industrial establishments in the vicinity of the Fure and Morge valleys. These small streams enter the Isère a score of kilometers below Grenoble. The station is one of the most interesting in France because it presents hydraulic features of an exceptional nature and was the first in the country to furnish current of a tension so high as 26,000 volts. Its administrative and financial management is also unusual, and for all these reasons the readers of The Engineering Record may be interested in the plant, although it is not, strictly speaking, a new one.

The station is located on the Drac about fifteen kilometers above its embouchure in the Isère near Grenoble. The portion of the stream along which the conduit is located is immediately above the mouth of the principal tributary, the Romanche, and the intake is about five kilometers farther upstream. The foundations of the building required about 4,800 cu. m. of concrete, which rests on gravel. On the ground floor are the generator and transformer rooms. On the floor above are the offices, storeroom, switchboard and its auxiliaries, and living apartments for the chief engineer.

The generator room, 44 m. long and 12 m. wide, contains the turbines and generators. Its whole length is commanded by a 15-ton traveling crane. In front of this room and in the basement is the transformer room, supplied with water under pressure for cooling the oil of the transformers. A light railway runs into this room to facilitate removing the apparatus to the shop for repairs. In the basement is likewise the cable tunnel for the connections between the generators and switchboard.

The station contains five generating units, each of 1,350 h.-p., two exciter units of 150-h.-p. each, and a 5-h.-p. turbine driving the pumps of the hydraulic accumulator employed with the servo-motors of the governing mechanism. The electric apparatus was furnished by the Swiss shops of Brown, Boveri & Co., and the turbines by Messrs. Neyret & Brenier, of Grenoble. The alternators furnish three-phase, 50-cycle current at 3,000 volts, and run at 300 r.p.m. The direct-current exciters run at 500 r.p.m. and are 115-volt machines.

The turbines are of the centripetal type with horizontal shafts and cylinder gates, and work with a draft of 5 m. They are direct connected to the generators by rubber couplings. Three of the wheels are governed by servo-motors and are connected to equalization gates, which are opened as the cylinder gates of the wheels are closed. In this way the same amount of water, 4 cu. m., is drawn for these wheels at all times, although it may not all pass through them, and severe water hammer is thus avoided.

There are five transformers raising the voltage from 3,000 to 15,000 and 26,000, according to the method of connecting them. Each is rated at 1,150 kw. The oil baths of these transformers are cooled by water, as before stated.

The leads from the alternators are carried in ducts to a switchboard on the ground floor, provided with the necessary instruments making connections with the transformers. The six cables from the latter are carried to a switchboard on the first floor, where the connections of the transformers in delta or star are made. The main distributing switchboard is located here also, and from it run the two transmission lines, each having two three-phase switches and a fuse.

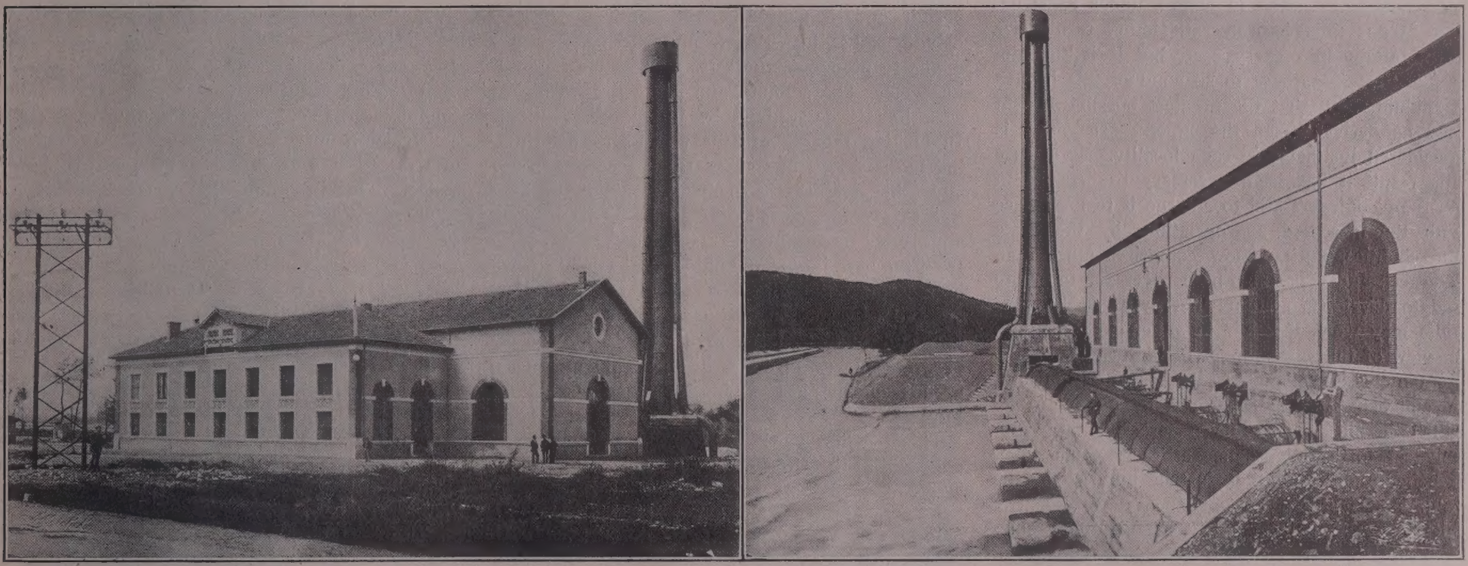
The hydraulic features of the plant are peculiar. In the vicinity of the intake, the river spreads itself over a width of a kilometer during floods, when the discharge may reach 1,200 cu. m., while during ordinary stages, when the discharge is not over 60 to 80 cu. m., only a small part of this bed is occupied by the stream. The course of the stream in the alluvial material of the bed is subject to frequent shifting. Under such conditions the head of water could be secured safely neither by an impounding dam nor by an ordinary diversion canal succeeded by pipe lines. Accordingly a low barrage has been constructed to turn the water into a conduit for some distance over the river bed. This conduit is 3.3 m. in diameter and 4,600 m. long, and is as interesting for its boldness as for its novelty.

The difference in elevation of the intake and tailrace is 37.4 m. and the discharge is 17 cu. m.

per second. Taking into account the different losses at screens, pipes, etc., the useful head is reduced to 32 m., which is equivalent to 7,200 h.-p.

The headworks comprise a fixed dam, a movable dam and an intake wall with sluices. After crossing the intake the water enters a large settling basin, from which leads a canal of 600 m. length, terminating in the chamber at which the main conduit starts. The fixed dam is a concrete structure 130 m. long, 12 m. thick at the base and 2 to 5 m. high. It rests on a bed of rubble 5 to 6 m. thick in places, but never rising more than 1.5 m. above the river bed. The movable dam has two leaves 8 m. long and 1.5 m. high, handled from a light steel service bridge; its object is to maintain a current which will prevent the accumulation of sand in front of the screens. The great quantity of material carried along by the river made special precautions of this character necessary.

The floor and pier of the movable dam rest on a 17x6-m. steel caisson sunk 10 m. below the level of the fixed dam by compressed air. In order to avoid erosion by sand, the floor of the dam, which rests on the caisson, is made of oak plank 14 cm. thick.



Two Views of the Champ Power Station Showing Relief Standpipe.

The concrete wall of the intake is 80 m. long and pierced with fifteen openings 2 m. wide and 1½ m. high, fitted with gates. A screen has been placed in front of this wall, on the river side, so that stones and debris carried along by the current through the movable dam, cannot enter the canal. This wall rests on a concrete footing 5 m. wide and 1.9 m. thick, which is supported on piles.

After the water passes the openings in this wall it enters the settling basin, having an area of 2,500 sq. m., which is provided with a spillway and gates for flushing out the sediment deposited here. The canal leading from it is 22 to 60 m. wide and 1½ to 4 m. deep. It is partly in excavation and partly in fill and has a lining of hydraulic lime concrete. The bottom grade is 0.4 per cent. When the station is running at its full load the velocity of flow in this canal is 0.35 m. per second, which permits the sand in suspension to settle. In order to flush out the sand, the current is increased by opening the sand gates in the chamber at the end of the canal and closing the headgates in the wall of the intake.

The entrance chamber is constructed of reinforced concrete and has an area of 900 sq. m. and a depth of 4 m. It is divided into two compartments by a wall 1.2 m. high surmounted by a screen. The first compartment, which receives the water from the canal, checks the velocity of the water and intercepts the suspended sand. A channel 2 m. wide and 0.5 m. deep runs along the toe of the wall between the compartments. Six trenches covered with slabs of reinforced concrete lead from the channel to as many sluice gates, which not only enables the sand to be flushed out but also furnishes means for regulating the height of water in the chamber. The wall in which the gates are located ends in a weir with its crest at such an elevation as to prevent the water in the inlet canal washing over its banks in case of a sudden shut-down of the power station.

The second compartment of the chamber has a depth varying from 4 to 7 m. Here is the entrance to the reinforced concrete conduit forming the first section of the pressure pipe line. A 4x3.5-m. gate enables this conduit to be closed; it bears against a train of rolls and can be operated by one man, and is fitted with two pilot gates to facilitate filling the conduit after it has been drained.

The sheet of water above the tops of the conduit is 2.7 m. deep to avoid the entrance of air into the pipe line. The entrance to the conduit is widened into a bell shape to facilitate the entrance of the water. The screen over the division wall is surmounted by a light platform for the use of the screen tenders.

The pressure pipe is 3.3 m. in diameter and laid on a grade of 0.7 per cent. Of its total length of 4,600 m., 2,100 m. are constructed of reinforced concrete and the remaining 2,500 m. of soft steel plate.

The reinforced concrete section, constructed by Messrs. Rossignole & Delamarge, of Grenoble, is intended to carry a maximum head of 20 m. of water. It is probably the most important conduit of this nature ever undertaken. It has a bed of hydraulic lime in which rests the pipe itself. The steel section is made of plates 7 to 15 mm. thick and rests on a concrete bed 0.5 m. thick, probably the first case in which a riveted pipe of such length and diameter was so supported. It has the great advantage of preventing any deformation of the pipe during the filling of the conduit and has given excellent results. Moreover the covering of the pipe to a depth of 0.4 m. with earth and sand has effectually prevented any sensible expansion and contraction. The steel sections were built by Messrs. Bouchayer & Viallet and Joya & Co., Grenoble.

The mass of water in motion in the conduit, amounting to about 40,000 cu. m. and moving with a velocity of 2 m. per second, requires special provisions to avoid water hammer in case of sudden shut-down at the power station. On this account two standpipes have been constructed on the reinforced concrete section and one on the riveted steel pipe. On the former section these are 9 and 20 m. high respectively, and 35 m. high on the steel pipe. The last is 3.3 m. in diameter at the base, 1.4 m. at the top and is installed at the end of the conduit, with which it is connected by a round bend. It is surmounted by a steel tank 3 m. in diameter and 2 m. high, from which three overflow pipes 0.6 m. in diameter descend on the outside of the main pipe to the trailrace. Various relief valves are also provided to reduce fluctuations of pressure in the conduit.

Current is furnished from the power station to 57 consumers. The main line is 30 km. long and divides at Moirans into a branch to Voiron and one to Rives. At the latter place, there is a further branching to Fure and Charavines. The 26,000-volt curent is distributed from 11 substations where the tension is reduced to 2,000 or 1,000 volts, at which it is delivered to the consumers. Certain consumers utilize the 1,000-volt current without further change, but the majority prefer to reduce the tension to 120 volts by means of transformers. About 58 per cent. of the water power acting on the wheels is available at the consumers' works, after transmission about 50 km. and two transformations. This 58 per. cent. gives 4,176 e. h. p. available for the consumers.

The company owning the works has a capital of 5,000,000 francs, invested in the installation, equivalent to approximately 1,200 francs per electric horse power at the consumers' works or 550 francs per water horse power. A syndicate of leading manufacturers in the district supplied with power engaged to take 3,000 h.-p. before the construction of the works and at the expiration of thirty years will take over the plant. With 3,300 h.-p. already engaged an annual income of 475,000 francs is assured, which will rise to 600,000 francs when the entire output is taken. In spite of the amortization in the short period of thirty years, it seems probable that the investment of the company in the plant will yield about 8 per cent.

THE NEW TURBINE-DRIVEN CUNARD LINER Carmania, which is 678 ft. long, and has a 72-ft. beam, with a displacement of 30,000 tons, recently developed 20.5 knots in speed trials.

Surveys for New York State Road Improvements.

A paper read at Cornell University by Mr. C. W. Trumbull, Division Engineer, New York State Engineer's Department.

The improvement of public highways by New York and other States has attracted and will continue to attract wide public attention. The constructive operations and the consequent results are the portions of the work which are open to observation by the taxpayer and the public, and they are, therefore, the subject of the greater part of this attention. It is as true in road work, however, as in other branches of engineering, that without the proper amount of preliminary investigation and study, and the exercising of due care in the preparation of plans, satisfactory economical results cannot be obtained; and when the expenditures for highway improvement aggregate millions of dollars, as they do in New York State at the present time, and will probably continue to do for several years to come, it will readily be seen that carelessness or lack of intelligent study in this preliminary work would result in an unwarranted waste of public money.

It is not to be supposed that with 100 roads, aggregating 400 miles in length, under construction at one time, entirely satisfactory results are to be attained in every case, but it is the aim of the State Engineer to so conduct this branch of public work that the greatest possible benefit may be derived from the expenditure which is considered justifiable in each locality. To secure this result it has been necessary to organize a corps of engineers and to enlarge it to keep pace with the increased appropriations by the State and counties, until it now comprises more than 400 men; and it has also been necessary to create and to develop a system whereby these different units may work together in an efficient manner. In view of the vast amount of highway improvement now contemplated, the organization and development of this corps can by no means be called complete, and this paper can, therefore, only set forth the practice at the present time, it being understood that further increase in the volume of work or circumstances unforeseen at this time may make extensive changes advisable.

The Higbie-Armstrong Law, under which the present highway work is being carried on, outlines the mode of procedure in securing State aid, the first step being the passage of a resolution by a county board of supervisors, either on its own initiative or upon petition by a majority of the landowners along the road, that public interest demands the improvement of a certain highway. These petitions for State aid are forwarded to the State Engineer, the number of miles covered by those received up to May 1, 1905, being more than 6,000.

The advisability of improving these roads must be investigated by the State Engineer, and, if approved by him, they must be surveyed and plans and specifications for such improvement as he considers advisable must be prepared and forwarded to the county board of supervisors. Upon the approval of these plans by the county board and their return to the State Engineer, they are given a place next in sequence upon the official list of roads to be improved, and contracts for the proposed construction are executed as fast as the appropriations by the State will allow. The law requires that their construction proceed in the exact order in which the roads are entered upon this list.

While it is essential that the surveys and plans be kept well in advance of the probable appropriation, it is, on the other hand, not advisable, owing to the liability of changes in the condition of the roads, to carry this part of the work greatly beyond a safe working limit. At the present time, therefore, plans have been prepared and adopted by the counties for only about one-quarter of the roads petitioned for. This provides a list requiring a State appropriation of $5,000,000 and a total expenditure of about $10,000,000.

During the season of 1904, four survey parties were employed in the eastern division of the State, two and sometimes three similar parties being engaged in each of the middle and western divisions. These parties usually consist of six men, and are subdivided into a location squad and a leveling squad. They are under the direction of a chief of party, who is directly responsible to the Division Engineer for the accuracy of the work, the conduct of his assistants and the expenditures incurred; and he proceeds with his party from place to place, surveying the roads covered by the petitions forwarded to him from the office of the Division Engineer. These are surveyed in such order as to form an economical route.

The surveys are base line surveys; that is, a series of straight lines, called base lines, is established, which follows in general the center line of the present road. Each of these lines is taken as long as the bends in the road will conveniently permit, and its ends are permanently marked by driving spikes into the ground and by measurements to permanent objects, such as trees, buildings, etc. The azimuth and magnetic bearing of each line is determined by transit observations. In making the surveys the process of determining the positions of houses, trees, fences, culverts and other features is to measure along the base line to a point opposite the object to be located, and, after recording that distance, to measure from the base line to the object. For convenience in recording the distances along the base line, the end of each 100-ft. interval is called a station and numbered consecutively as the survey progresses, intermediate distances being measured from the last station recorded, as station 179+35.

This location work is executed with accuracy only within the right of way or within the limits which will probably be affected by the proposed improvement. The location and dimensions of buildings, streams and other features, outside of these limits and within 100 or 200 ft. of the road, are estimated and recorded. When it is evident that the road will have to be widened, a note is made giving the side upon which land should be taken, with the controlling reasons. Bridges and culverts are located, measured and described, and records made showing the condition of the abutments and superstructures. Notes in regard to the flow of streams, areas of watersheds, maximum high-water marks and other details which might prove of value in the design of new structures or in fixing the grade of the improved road are recorded in each instance.

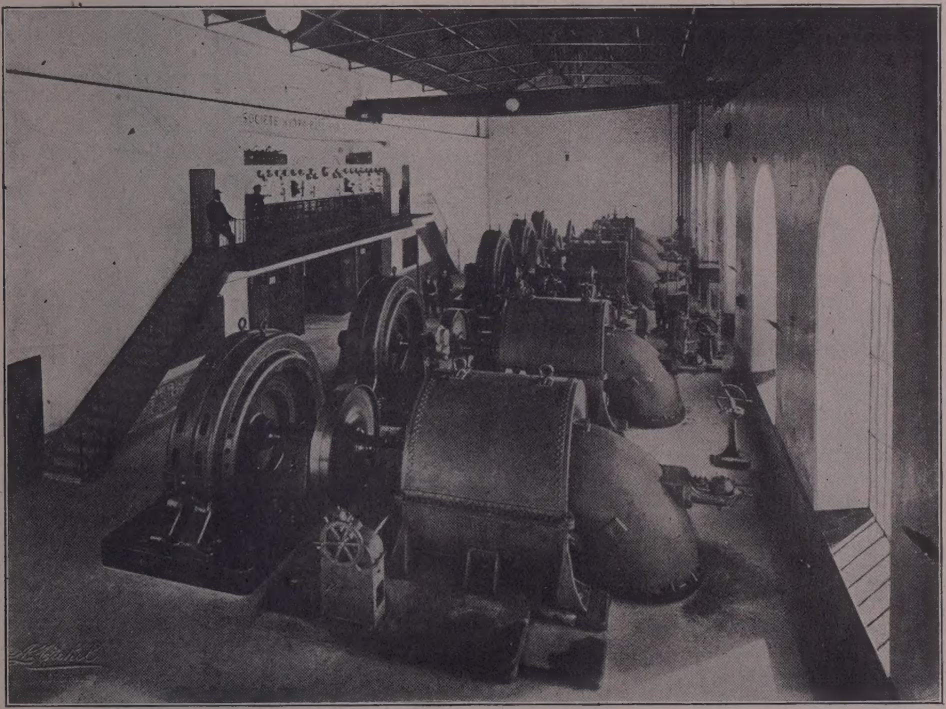
Where a marked improvement in line or grade can be made, or where the cost of construction or of maintenance in after years can be decreased, it is often advisable to adopt an entire new location for a portion of the road. When such a condition exists, the chief of party reports the facts at once to the Division Engineer, and, after approval by him, surveys the proposed new location and also surveys the present route of the highway for the purpose of comparative estimates. This new location line follows what appears to be the most advantageous location for the new center line, but final adjustment is determined later with the aid of the plans. It is often advisable to survey two or more proposed routes for the new location, and detailed comparative estimates are made before a final choice is made. The most important considerations, other than cost, governing this choice are the length of the new route, the grades obtained, the character of the soil and country, and the effect upon the locality through which the road will extend. Wherever possible the new location is so arranged that no houses or farm buildings will be affected by the change, and the cost of maintenance can then be decreased by abandoning the old location. Railroad grade crossings can often be avoided by a change in line or grade, and the necessary surveys are made wherever this appears feasible.

Survey parties are required to record the character of the country through which the road being surveyed extends, the nature of the soil, the condition of the present road-bed, the nature and amount of traffic and the existence of rock or of unstable material. Especial care is taken to determine all places in the road where the conditions are such as to require construction of an unusual or elaborate nature. These places are due to wet or swampy ground, quicksand, clay pockets, etc. They develop in the spring, when the frost is going out of the ground, and are usually known locally as "soft spots." Information in regard to these places, obtained from Highway Commissioners and residents along the road, is often valuable and is recorded by the survey party. Suggestions are also made in the notes as to the most feasible methods of improving these places and the controlling reasons, the final selection of a method being determined later in the office. Samples of the available stone or gravel for construction purposes are forwarded to the office and records are made of the location of quarries, gravel pits, railroad sidings, wharves or canals.

The duty of a leveling squad is to take a series of levels or cross sections covering the entire width of the right of way, and as much more as is necesary, each reading being located by reference to the base line already mentioned. Where a canal, railroad, geological survey or previous road survey bench mark can be reached at small expense, the elevations are referred to tide-water datum. When this is not feasible, an assumed datum is used. Cross sections are taken at intervals of 100 ft., and where marked changes occur in the gradient of the road or in the topography at the sides of the road, as many intermediate sections are taken as will be necessary to form an intelligent estimate of the amount of earthwork required in grading the proposed improved road.

At the place selected for a cross section level readings are taken in the center and at the edges of the beaten tracks, in the gutters, at sidewalks, shade trees, fences and sufficient other places so that straight lines connecting these points accurately represent the surface; and the place to which each reading and distance applies is recorded. Usually it is sufficient to estimate the slope beyond the fence lines as down one in ten or level, etc., but where there is probability of heavy cutting or filling, the sections are extended beyond the fence lines. The elevation of the sill of every building near enough to the road to be a controlling feature in the fixing of the new grade is recorded and the character of the building noted. At bridges readings are taken to determine the elevation of the floor, and of the top and bottom of the abutments, and a profile is taken extending far enough up and down the bed of the stream to give the information necessary in determining the advisability of its being lowered or the location changed. Similar readings are taken at and near all culverts and drains and extended until sufficient information is obtained to plan a thorough drainage system for the road. All level readings are taken to the nearest tenth of a foot, except at turning points and bench marks, which are taken to hundredths. A bench mark for use during construction is established upon some permanent object at least once in every 1,000 ft., and the levels are checked either by connecting with some previous bench mark near the end of the survey or by a series of check levels back to the point of beginning.

All survey notes are recorded in leather-bound books of standard form and size, the location notes and the level notes being kept in separate books. As each survey is completed, these books are forwarded to the offices of the Division Engineer. The roads are there formed, for convenience in construction, into sections of about six miles in length, either by combining several roads in the same locality or by subdividing a longer road. They are given local names, derived usually from the names of the nearest city or village to which the road leads, as the "Albany-Schenectady Road." The work of preparing plans for the improvement of the roads is performed by an office force under the direction of the Division Engineer and under the intermediate supervision of an assistant engineer assigned to that duty. As no construction work is in progress during the winter months, it is customary during that time to assign to office duty as large a portion of the construction force as can be economically employed. During the past winter, in anticipation of the probable approval by the people of a bond issue for road work, this force was maintained at about 60 men in the eastern division, with a less number in the middle and western divisions.



The Generator Room of the Champ Power Station.

After computing the level notes, the first step in the preparation of plans is the plotting of a working plan, profile and cross sections, showing in detail the conditions along the road as recorded in the notes. The plan is plotted on continuous roll detail paper to a scale of 100 ft. to an inch, and in pencil only, except the base line, which is plotted, checked and inked. Names of property owners, streams, railroads and other information, which will later be traced on the finished plans, are lettered neatly in plain lettering, and notes regarding structures and other matters, of use only during the planning of the improvement, are written in the proper places.

The profile is plotted on continuous-roll cross-section paper, the scales used being 100 ft. to an inch horizontally and 10 ft. to an inch vertically, and is then checked and inked. The elevations used in plotting the profile are those taken in the center of the present beaten track. In a new right of way, the base-line elevations are used and corrected later, should the new center line deviate from the base line. All existing culverts, bridges and railroad crossings are plotted in their proper locations upon the profile and all notes regarding them are written on the sheet. Notes regarding the soil, rock outcrops, unstable foundations, the feasibility of different methods of construction and, in short, all information governing the character and methods of improvement are, as a precautionary measure, written in the proper place upon the profile or upon the plan and often upon both.

The cross sections are plotted to a scale of 10 ft. to an inch upon standard sheets of the best grade plate cross-section paper and are checked and inked. The center elevation and the letters denoting the point at which the reading was taken, such as "edge of road," "wall," etc., are copied in ink.

In determining the character of the improvement for any road, due consideration is given to the nature of the traffic, the materials available, the condition of the present road and the community through which it extends; also the desires of the taxpayers of the community, as expressed through their Highway Commissioners, Supervisors or County Engineers. The latter point is one in regard to which some confusion has existed, many people believing that to petition for State aid was to petition for an expensive macadam road. On the contrary, the State has constructed many miles of gravel, shale and earth roads with excellent results, and the State Engineer is ready at all times to construct the kind of road desired by the residents of the community through which it passes, provided that investigation shows that this can be done with wisdom and economy.

Many localities are entirely without the best grades of road materials and are so situated that the expense of importing materials from other places is so great as to make it prohibitive. In these districts it is necessary to plan the improvement so as to construct the best roads possible with the materials available, and the results attained thus far have proven very satisfactory. This is especially true in the locality where shale rock abounds. Many miles of road have been surfaced with this seemingly poor material at a small expense and with good results. In districts where gravel abounds it is used very extensively and is chosen as surfacing material on the less important roads wherever available.

It is not customary, in preparing the plans and specifications for a macadam road, to specify the source from which the stone shall be obtained. It is necessary, however, to determine whether or not suitable stone can be obtained at a nominal expense, and it is customary to specify the kind to be used in each course of macadam. Before commencing construction the contractor must submit samples of the stone he proposes to use, and it must be satisfactory to the State Engineer. Much valuable information in regard to the quality of stone in different localities has been obtained as a result of tests and former road work, and this enables a choice of stone to be made with almost a certainty of satisfactory results. As macadam roads are built in two or three courses, a poorer quality local stone is often specified for the lower course, because of its cheapness, and an imported stone is called for in the upper course or courses; or the local stone is used throughout and if deficient in binding quality, imported screenings are used. As a general rule, in the choice of the character of the improvement, the cheapest available material is used except on the more important roads; nevertheless, the policy of the Department has been to never use an inferior grade of material where the expense of putting it on the road, either from hauling or other causes, is such that a nominally increased expenditure would permit a more durable form of construction. For instance, the importance of a certain road might, from local conditions, appear to justify only gravel surfacing. Upon investigation the nearest available gravel supply might be found to be two or more miles from the road to be improved, thus necessitating an average haul of over two miles and an expense of seventy-five cents or more per cubic yard before the gravel reaches the road. On the other hand, it might be found that suitable stone could be obtained near by, or within the right of way, where its removal would be of benefit in reducing the grades. As this stone can be removed and crushed at a cost of about eighty-five cents per cubic yard, it will readily be seen that, considering the results obtained, the macadam road should be the choice.

The character of the improvement having been decided upon for the road under consideration, a preliminary grade line is drawn upon the profile. This grade line represents the elevation of the center of the proposed finished surface, and wherever a reasonably smooth grade can be obtained by so doing it is placed at a distance above the present grade line which permits the new surface material to be placed directly upon the present traveled way. This is often rendered impracticable by other and more urgent considerations, such as drainage and the reducing of the steeper grades by cutting at the tops of hills and filling at the bottom. Effort is made to keep within certain maximum grades upon each road. For instance, where a moderate amount of cutting and filling will make the rate upon most of the hills 6 ft. or less in a hundred, it may be desirable to take this as a maximum rate for that road, and if only one or two excessively steep hills are encountered, the road can usually be relocated so that they can be avoided almost entirely or overcome by using the adopted maximum grade. In this connection it is necessary to consider the direction of the heavy traffic over the road, as the maximum grade need not necessarily be the same in both directions.

Houses, intersecting roads, drives, shade trees, electric railway tracks, culverts, bridges and other controlling features add to the difficulty of determining a proper grade line, and it is customary, before its final adjustment, to have an inspection of the road made by an engineer whose experience in former road work enables him, as he passes over the road and studies the proposed profile, to suggest changes and make recommendations regarding features which had been overlooked or had been the subject of doubt while being studied in the office. At the same time, he makes valuable suggestions regarding the location of new culverts and drains and their sizes, which, being aided by the profile, he can do to better advantage than could the survey party.

With the aid of this additional data the grade line is fixed and in so doing it is customary, wherever feasible, to "balance" within limits of about 2,000 ft. the amounts of excavation and embankment. That is, two points having been selected 2,000 ft. apart or less and so situated that the haul from cut to fill will be down hill, the grade line between is so adjusted that the amount of excavation exceeds the embankment by about 30 per cent. Experience has shown this to be about the amount of excess excavation necessary to make proper allowance for the waste of material unfit to use and to retain enough suitable material to form the embankment. It is often not advisable to balance the excavation and embankment between these selected points; for instance, should the excavation contain rock it is more economical to avoid cutting this wherever possible and to obtain the material necessary to form the embankment from outside the right of way. Also, where none of the excavated material is suitable for forming embankment it is necessary to obtain selected material elsewhere. A general rule of the office requires that in balancing quantities the greater be reduced wherever possible.

In drawing the cross section of the proposed improved road upon the plotted sections of the present road, transparent celluloid templates are used. These templates conform to the cross section of the improved road drawn to the proper scale, and are laid successively upon each plotted section, a line representing the proposed surface being then drawn with pencil. It is necessary that this be done simultaneously with the fixing of the grade line, as only successive trials will show when the quantities of excavation and embankment balance and do not exceed the amount considered justifiable.

The cross section of the improved road having been drawn upon each plotted section of the original surface, the areas of cut and fill are measured with planimeters and arranged in tabular form upon sheets called quantity sheets. The quantities are then computed by averaging the end areas and multiplying by the distance between the sections, and if the totals between the selected points are shown to be excessive, or not well balanced, the operation is repeated, effort being made to reduce the quantities in all places where they appear unnecessarily large. In placing the templates as outlined above it is often found advisable to move the center line of the improved road to the right or left of the base line, so as to avoid heavy side cutting or to keep within the present right of way. Where this is done the new center line is adjusted and its position and the position of the base line are shown on the plan and on the sections.

In considering the advisability of rebuilding, replacing or renewing culverts and in determining the size and location of new culverts, reference is made to the survey and inspection notes, and the recommendations are checked as much as possible by consulting the plan, profile and sections and by scaling the drainage areas from the United States geological sheets. For convenience in estimating and recording, the old and new culverts are tabulated by stations on a standard sheet called a culvert sheet. This contains spaces in which to record the sizes and lengths of the old and new culverts, with the inspection notes, and the amounts of the different classes of work necessary in the construction, such as masonry, paving, steel, concrete, timber, etc. The determination of these quantities is greatly simplified by standardizing all structures in connection with highway improvement and preparing tables or charts which give the actual quantities for all sizes. The standard designs for culverts have recently been modified and the use of reinforced concrete has been largely adopted because of the ease of construction and the saving of cost.

A sheet is also compiled in standard form, giving by stations the location and amount of all items of work necessary in the construction of the road excepting those already listed upon the culvert sheets. This includes guard rail, ditch crossings, paved gutters, retaining walls, under drains, guide boards, highway intersections, macadam, gravel or other surfacing, excavation and embankment. In determining these quantities dependence is placed largely upon the inspection notes, though more or less arbitrary rules, derived from previous experience, have been adopted for many items. For instance, paved gutters are estimated wherever called for in the notes, and also on all grades of 5 per cent. or over, except near summits and for about 150 ft. below culverts, unless it should be clearly evident from the nature of the soil or the contour of the surface that they will not be required. If found to be unnecessary in any instance, by observation during the construction of the road, which usually requires two seasons, the quantity not used is deducted from what was originally estimated and a corresponding reduction in the contract price of the road is made. Guard rail is estimated in all places where the cross section shows a difference in elevation of 4 ft. or more between the center of the improved road and the toe of the slope. A four to one slope is used in fills of less than 4 ft., and the guard rail is omitted. The details of construction, as recorded upon these sheets, are all carefully checked before proceeding with the preparation of the finished plans or the estimate of cost.

The finished plans are drawn upon sheets of tracing cloth 21 x 33 in. between borders, with a 1½-in. margin. The plan, profile and sections of about 3,000 ft. of road are traced upon each sheet, with the stations increasing from left to right. The plan is placed at the top of the sheet, with the profile in the proper position beneath and the cross sections either above or below the profile, as most convenient. The cross sections are drawn facing the right of the sheet and are placed so that the center of the improved road at each section is on a line drawn in ink across the sheet. The position of the base line at each station is then shown by a short line through the new section, thus enabling the improved road to be staked out by reference to the original base line.

All existing features upon the plans are drawn in black ink and the new construction, figures, etc., are drawn in red, water colors instead of ink being used for the latter, as it gives, when printed, a more distinct line on a blue print. Neatness and clearness are what is attempted in the preparation of plans and no elaborate lettering or other features are required or permitted, as they are considered an unnecessary expense. The center line of the improved road and lines indicating the new culverts and retaining walls are the only new features drawn upon the map; all other information regarding the proposed construction being shown in the form of notes in the proper places, as "Station 110 + 35 new guard rail begins"; "Station 111 + 10 new 3 ft. x 4 ft. concrete culvert"; "Station 111 + 80 new guard rail ends," etc.

Upon the profile the elevation of the center of the present traveled way is given in black near each station, and the new rates of grade and the elevations at the changes in rate are given above the grade line in red. Existing culverts are shown, with a note giving their character and size. Upon the cross sections, retaining walls, paved ditches and other features are shown in the proper places and the center elevations, both present and proposed, are given at each station.

A title of standard form, giving the petition and road numbers, the name of the road and a concise description of its location is placed upon the first sheet of the tracings. A location map traced from the United States geological sheets, covering the locality in which the road is situated, is also placed upon this sheet, and the road to be improved shown upon it by a heavy red line. Attached to each set of plans are sheets showing the details of all forms of construction called for upon the plans, the adoption of standard forms enabling similar sheets to be used for each road. These sheets give drawings of concrete and masonry culverts of all sizes, guard rail of several forms, ditch crossings and other details, and also show typical cross sections of improved roads, the widths of which are left blank upon the prints and later filled in to apply to the road under consideration. The plans for each road are bound together at the left of the sheets and stamps are placed in the lower right corner to receive the signatures of approval by the Division Engineer, the State Engineer and the Clerk of the county board of supervisors.

An estimate of the cost of constructing each road is compiled and forwarded with the plans to the county board, and, if approved by them the county appropriation is based upon this estimate. Owing to delays having been occasioned in the past by often not receiving a bid for construction which is within the appropriation, unit prices have been adopted, which will insure the estimates being in excess of a probable bid, the unexpended balance of the county appropriation being retained in each case by the county. In preparing the estimate it is only necessary to summarize the various items of work previously listed on the culvert and list sheets, and to apply unit prices, which experience has shown to be, as stated above, slightly in excess of the actual cost, increased by a reasonable profit to the contractor.

The prices for each item of work except excavation, embankment and surfacing have been found to be sufficiently uniform in different parts of the State to allow the adoption of fixed prices for the purpose of estimate. The estimated price of excavation varies in each locality, and a composite price is obtained by combining the estimated prices of the various classes of excavation, such as rock and earth, in the proportions in which each class, as measured, will occur on the road to be improved. No classification, however, is made in the excavation when the contract is awarded or when the work is performed. In estimating the price of surfacing material it is necessary to consider the probable source of supply, transportation, manipulation and other details so that the price varies greatly on the different roads. To obtain the total estimated cost of the road, the cost of the different items is summarized and to this sum is added 10 per cent. to cover engineering expenses, 3 per cent. for contingencies and $25 to $50 for advertising. For the purposes of comparison this estimate is divided by the mileage of the road, thus giving the estimated cost per mile of improved road.

The present Highway Law places the responsibility of acquiring additional land for highway purposes upon the county authorities. It is not customary to acquire land if it can be avoided without sacrificing to too great an extent the improvement of the road, but where new right of way is advisable a survey of the land required is made by a party detailed for that purpose. Where the land to be acquired is a parcel of land along the side of the existing highway, a transit line is run around it, the bearings and distances being recorded. Where a highway is to be relocated and an entire new right of way obtained, the center line of the proposed highway is run by using circular curves and recording the lengths and bearings of their connecting tangents. A parcel of land of uniform width, usually 60 ft., is acquired, 30 ft. on each side of the center line. Plans and descriptions of these parcels of land are prepared and the areas computed, the legal process of acquiring the land being then undertaken by the county authorities, and the expense asumed as a county charge.

THE EROSIVE ACTION OF WATER is well shown in a remarkably interesting photograph taken at the toe of the Assuan dam across the Nile, contributed to "Engineering" by Sir Benjamin Baker. The view shows an enormous boulder, 17 ft. long, 12 ft. wide and 7 ft. thick, lying against the base of this structure. The dam occasionally raises the water level more than 60 ft. above the downstream surface, but the greatest head under which it is discharged through the sluices, owing to their location at different elevations, is 29½ ft. This gives the discharge a velocity not exceeding 35 ft. a second.

The Hydraulic Works of the Chittenden Power Co., Rutland.

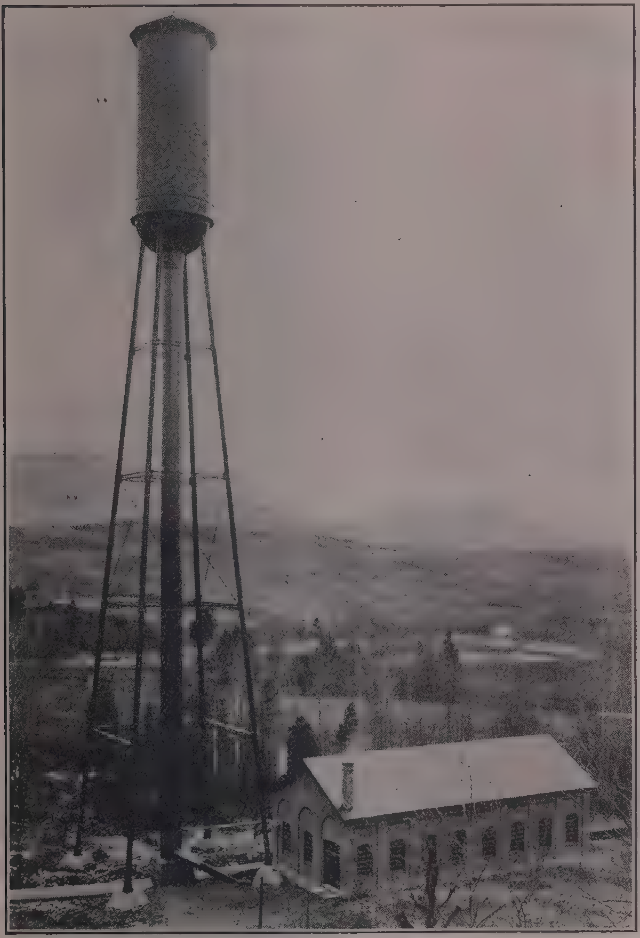
The Chittenden Power Co., of Rutland, Vt., has recently completed a hydraulic power development about 4 miles from that city which will furnish electricity for street railway, light and power purposes. The works are mainly interesting on account of the unusual character of their hydraulic features. The water is furnished at present from what is known as the East Pittsford reservoir, which covers an area of 320 acres, contains 63,000,000 cu. ft. and has a tributary drainage area of 9 square miles. Five miles farther upstream is the Chittenden reservoir, of 800 acres area, of 435,000,000 cu. ft. capacity, fed by a catchment basin of 15 square miles. There is a fall of 475 ft. between the two reservoirs. This is at present not utilized, as the discharge from the upper reservoir now merely runs down freely into the lower reservoir, which is 222 ft. above the tail race of the power station, 8,000 ft. distant. At a later date, it may be desirable to utilize the high head of the upper reservoir by means of a conduit, but at the present time it is useful as a regulator of the stream flow. The annual rainfall on the valley of the stream is about 45 in., of which about 70 per cent. is expected to be impounded.

The Chittenden reservoir is formed by a dam 750 ft. long and 54 ft. in maximum height; 100 ft. of its length is a waste weir of stone masonry, while the remaining portion is an earth structure with a masonry core wall. The base of the dam contains two 48-in. pipes, one a drain and the other a section of what will eventually be the power line from this reservoir.

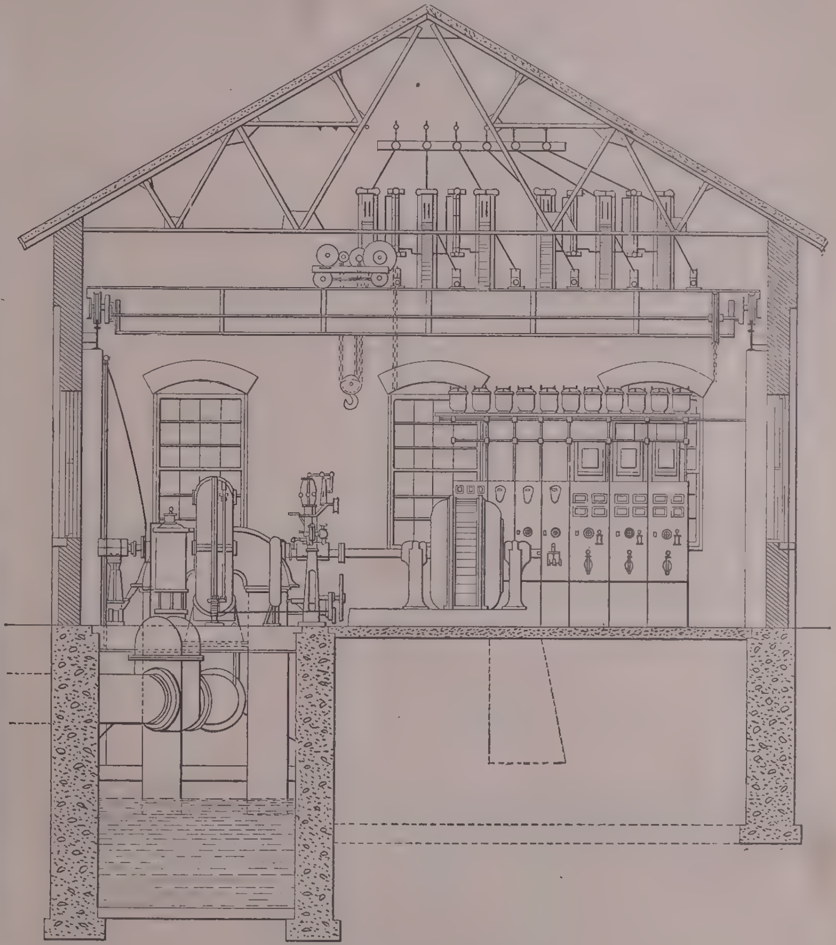
The East Pittsford dam has 474 ft. of earth embankment and 111 ft. of masonry spillway, and its maximum height is 31 ft. The dam is 12 ft. wide on top, with 1:2 slopes, and has a masonry core wall rising to within 3 ft. of the top. In its deepest section the downstream side of the dam has a rock filling. The lowest part of the river bed is about 20 ft. below the flow line, and the center of the 60-in. steel pipe that pierces the embankment beneath the gate-house is about 15 ft. under the flow line. A 24-in. drain is also carried through the embankment at this place. The two pipes ending in the well of a masonry gate chamber, lined with brick.

The 60-in. pipe follows the valley of the creek for a distance of 8,000 ft. to the power station and terminates there at the cases of the horizontal turbine wheels, made by the S. Morgan Smith Co. At this station the normal surface of the tail water is 222 ft. below the level of the lower reservoir, and the effective head on them under operation at full load is 200 to 204 ft. The thickness of the steel sheets of the 60-in. pipe line varies from ¼ in. at its upper end to ⅜ in. at the lower end, and it has a coating of pitch and tar inside and out. Besides this coating the lower part of the pipe has an interior coating of cement for its entire length. The entire pipe line lies in a trench and the minimum thickness of the earth covering is 15 in.

Connected with the pipe line at a point a few feet from the power station is a standpipe terminating in a tank at the top, this tank being supported by a steel tower, the whole of the well-known type built by the Chicago Bridge & Iron Co. Above the foundations the height of this standpipe and water tower is 220 ft., which gives its top an elevation 17 ft. above the flow line of the lower reservoir. Both the standpipe and water tank have an inner and an outer part with a space between them. The outer part of the standpipe is 5 ft. 8 in. in diameter, and the inner part has a diameter of 3 ft. At a exceeding 35 ft. a second.



Regulating Standpipe at Power Station.



Cross-Section of Power Station.

nects with a tank 18 ft. in diameter and the inner pipe with a concentric tank 15 in diameter.

From a point near the top of the tank to one 7 ft. above the foundations of the steel tower, the annular space between the outer and inner standpipe and between the outer and inner water tank contains a sufficient length of 2-in. steam pipe to give 265 sq. ft. of heating surface. This system of piping is connected with a boiler in the power station nearby, so that any water flowing down between the inner and outer tanks and standpipes may be kept from freezing in cold weather.

Connection is made between the inner 3-ft. pipe just named and the 5-ft. pipe line from the lower reservoir, so that the water rises in the inner tank to an elevation corresponding with the head at the lower end of this pipe line. When one or more generators are quickly loaded in the power station the stored water in the tank at the top of the standpipe is sufficient to prevent more than a small drop in head. At the time when the load at the station is reduced by a large amount, the surplus energy of the column of water 8,000 ft. long that is flowing down from the reservoir is expended in an overflow from the inner to the outer tank of the standpipe. This overflow passes to the tail race beneath the power station as the outer pipe discharges into the tail race.

At a point a few feet beyond the connection between the 60-in. pipe line and the standpipe, a branch 30 in. in diameter leaves the pipe line and enters the pit beneath the turbine wheels in the station. With intervals of 12 to 15 ft. between them three other such branches connect with the pipe line, and from its lower end a branch 18 in. in diameter goes into the same pit. The four branches of 30-in. pipe are intended to connect with turbine wheels for four main electric generators, and the 18-in. branch delivers water to the turbines that drive a pair of exciter dynamos.

The power station is located near the bed of the creek from which water is diverted by the pipe line at the lower reservoir, and the tail race beneath it is continued to join this bed a few rods downstream. In outside plan the station measures 37¼ x 79¾ ft., and it is one story high. The foundation and floor are of concrete, the walls of brick and the roof of concrete slabs reinforced with expanded metal, supported on steel trusses. Along that side of the station next to the 60-in. pipe line runs a concrete pit 10 ft. wide and 14 ft. deep beneath the floor level. Into the upper part of this pit come the branch pipes from the 60-in. line, and in its lower part is the tail water. At the downstream end of the station this pit joins an open conduit of similar dimensions, with sides and bottom of concrete, which carries the tail water to the creek a few rods below.

The top of the pit in the station is spanned with steel I-beams, and these same beams extend over the tops of piers beneath the floor that are ranged in a row parallel with the pit. Each of four sets of beams over the pit is intended to support a horizontal double discharge 90-in. turbine wheel, rated at 770 h.-p. and 500 r.p.m., under a water head of 200 ft. Three of these wheels are now in position.

Water rises into each wheel from its 30-in. supply pipe underneath, in which the valve operates by water pressure, and is discharged through two 24-in. draft tubes, so that there is no unbalanced end pressure. Each of these wheels has its center 12½ ft. above the normal level of the tail water, and 18 ft. above the bottom of the pit. A type Q Lombard governor regulates the speed of each turbine. The wheel is supported on a shaft that passes through a bearing on each side of its case, and this shaft has a flange coupling on the end toward the center of the station. On the same set of beams that carries the wheel case and bearings a complete electric generator with its own bedplate is mounted, and the coupling on the extended shaft of this generator connects with that on the wheel shaft. Each of the generators thus connected is of the revolving-magnet type, and is rated at 400 kw., 13,200 volts, 25 cycles, three-phase.

With the three generators in position the station has a present capacity of 1,200 kw., and this can be increased to 1,600 kw. by the addition of another wheel and generator at any time. Exciting current for the magnets of these alternators is supplied by either of two 45-kw., 125-volt dynamos, each of which is direct connected to a 34-in. horizontal turbine designed for 725 r.p.m., and regulated by a Lombard governor. Both of these wheels take water from the 18-in. branch pipe named above, and discharge it into the pit through draft tubes.

Rising from the floor level at a distance of 8 ft. 4 in. from one of the shorter end walls of the station are the eight marble panels of the switchboard, and between these panels and the wall a row of oil switch cells is located. Cables from the generators and exciters lie in clay conduits beneath the concrete floor and come up for connection to the switches and other apparatus between the front of the switchboard and the wall. The oil switch for each three-phase generator and for each of the two transmission circuits that enter the station is operated by hand levers on the front of the board. Each of these two circuits consists of three bare No. 4 copper wires, and these wires after passing through the brick end wall in porcelain tubes are secured to a row of insulators and connect first with lightning arresters and then through choke coils with the oil switches.

A Tyrrel regulator, which is used to limit voltage variations, is located near the switchboard. At the switchboard four panels are devoted to the alternators, two to the exciting dynamos, one to the transmission line and one to regulation. The generator panels have ammeters, voltmeters and polyphase wattmeters. On the exciter panels are ammeters and voltmeters. With the panel for the transmission circuits is an ammeter for each phase and a three-phase watt-hour meter. Each of the alternators is belted to a Shafer & Budenberg indicating and recording tachometer, so that the speed of rotation may be noted.

Forty incandescent lamps operated by the exciting dynamos light the generating station, and warming will be done by the steam heater used to warm the coils in the standpipe. Spanning the smaller dimension of the station floor and traveling over almost its entire length there is a hand-operated crane supported by abutments inside of the two longer walls. At these abutments the total thickness of the brickwork is 30 in., and between them the wall is 13 in. thick. On these walls rests the weight of the steel and concrete roof, and that of the traveling crane.

After passing through its porcelain tube with a slope toward the outside of the end wall of the power station, each of the No. 4 bare copper wires of the 13,200-volt circuits is secured to an insulator about 27 in. from the wall, on a wooden cross arm and steel bracket. The porcelain tubes through which the wires pass are set 18 in. apart in the brick wall.

From the generating station just considered to the sub-station of the Chittenden Power Company in Rutland, a distance of 4 miles, the two three-phase circuits run by separate pole lines. Each pole has a single cross arm and carries the three wires in triangular form, one at the pole top and the other two at the ends of the arm. On the run between the generating station and the Rutland sub-station the wires of each circuit are transposed twice, and they are supported partly by glass and partly by porcelain insulators. Poles not over 30 ft. long are used for much of the transmission line.

The sub-station in Rutland is a one-story building measuring 30 ft. x 32 ft. in outside ground plan, and having concrete foundations and floor, brick walls and a roof of concrete and expanded metal. Six inches is the thickness of the floor and 3½ in. that of the roof, which latter is supported by 18-in., 55-lb. I-beams, cross laid with others of 8 in. height and 18 lb. weight per linear foot.

Into this sub-station the two circuits come through porcelain tubes set 18 in. apart in one of the brick side walls, and 18 ft. 9 in. from the ground. Before entering its tube each wire is secured to an insulator about 9 in. below the opening, and the six insulators are carried by a single cross arm that is held 15 in. from the brick wall by iron brackets. On entering the sub-station the wires of the two circuits are first supported by another set of insulators, and then connect with lightning arresters and pass through choke coils before reaching the oil switches. From these switches the circuits go to a group of three 125-kw. transformers that reduce the 13,200-volt pressure to that necessary for 600-volt rotary converters. Two such converters have been installed, each having a capacity of 150 kw., and their output is to be used for the operation of the Rutland Street Railway. In connection with these converters two reactance coils are provided.

In addition to the equipment for the operation of the local street railway, the Rutland sub-station will contain a rectifier, series transformer and booster, which will be used to give the rotary converters a generator action when this is necessary to maintain the transmission voltage on a line running to Castleton, 12½ miles distant. In connection with this sub-station equipment, a storage battery of 280 cells will be employed and will be located in a battery house only a short distance away.

The battery house measures 30 x 56 ft. on the ground outside, is one story high, has a concrete floor, brick walls and a roof of concrete slabs with expanded metal.

From the sub-station at Rutland to that at Castleton the distance is 12.5 miles, and the transmission line between them is a single circuit of No. 4 copper wires, arranged like those between the power house and Rutland. In the Castleton sub-station there are three 150-kw. transformers and two rotary converters of 150 kw. and 200 kw. capacity, respectively, for the street railway. The prospect is that a genral distribution of light and power will also take place from this sub-station. At both the Rutland and the Castleton sub-stations the transformers are of the air-blast type, and there is a motor-driven blower equipment in each.

Much of the work on the two reservoirs has been done by day labor under the Chittenden Power Company. The pipe line was laid by contract. For the entire power station and the sub-stations with their equipments, the J. G. White Co. is the contractor, and has aided in the design. Electric generating and regulating equipments at both the power station and the sub-stations were made by the General Electric Co. Messrs. French & Bryant, of Boston, are the engineers of the entire hydraulic and electric work above described. Mr. John Bogart, of New York, has been consulted as to some part of the hydraulic development. Mr. G. Tracy Rogers is president of the Chittenden Power Company; Mr. Leo H. Wise, vice-president; Mr. Charles H. West, secretary and treasurer, and Mr. David Fox is general manager.

CURRENT NEWS SUPPLEMENT

DECEMBER 9, 1905.

DIRECTORY OF NATIONAL TECHNICAL AND TRADE SOCIETIES.

American Society of Civil Engineers. Secretary, Charles Warren Hunt, 220 West 57th St., New York. Next meeting, Dec. 20. Paper on Inspection of Treatment for Protection of Timber.

American Society of Mechanical Engineers. Secretary, F. R. Hutton, 12 West 31st St., New York.

American Institute of Electrical Engineers. Secretary, Ralph W. Pope, 95 Liberty St., New York Next meeting, Dec. 15, 44 West 27th St., New York.

National Fire Protection Association. Secretary, W. H. Merrill, Jr., Chicago.

American Institute of Mining Engineers. Secretary, R. W. Raymond, 99 John St., New York.

American Institute of Architects. Secretary, Glenn Brown, Washington, D. C.

Association of Engineering Societies. Secretary, Frederick Brooks, 31 Milk Street, Boston, Mass.

American Society of Heating and Ventilating Engineers. Secretary, W. M. Mackay, 235 Water St., New York.

Canadian Society of Civil Engineers. Secretary, Clement H. McLeod, 877 Dorchester St., Montreal.

American Public Health Association. Secretary, Dr. C. O. Probst, Columbus, O.

Society for the Promotion of Engineering Education. Secretary, Prof. M. S. Ketchum, University of Colorado, Boulder, Colo.

American Society for Testing Materials. Secretary Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

American Society of Municipal Improvements. Secretary, George W. Tillson, Room 12, Municipal Building, Brooklyn, N. Y.

Association of Railway Superintendents of Bridges and Buildings. Secretary, S. F. Paterson, Concord, N. H.

American Railway Engineering and Maintenance of Way Association. Secretary, L. C. Fritch, 1562 Monadnock Block, Chicago.

American Water-Works Association. Secretary, J. M. Diven, Charleston, S. C.

American Foundrymen's Association. Secretary, Richard Moldenke, P. O. Box 432, New York.

Engine Builders' Association of the United States. Secretary, J. L. Lyle, 39 Cortlandt St., New York.

American Public Works Association. Secretary, W. H. Flint, Chattanooga.

Association of American Portland Cement Manufacturers.. President, J. B. Lober, 1232 Land Title Building, Philadelphia.

American Society of Refrigerating Engineers. Secretary, H. W. Ross, Room 806, 258 Broadway, New York.

National Association of Manufacturers of Sand-Lime Products. Secretary, H. A. Duerr, Wilmington, Del.

National Association of Cement-Users. President, Richard L. Humphrey, Harrison Building, Philadelphia, Pa.

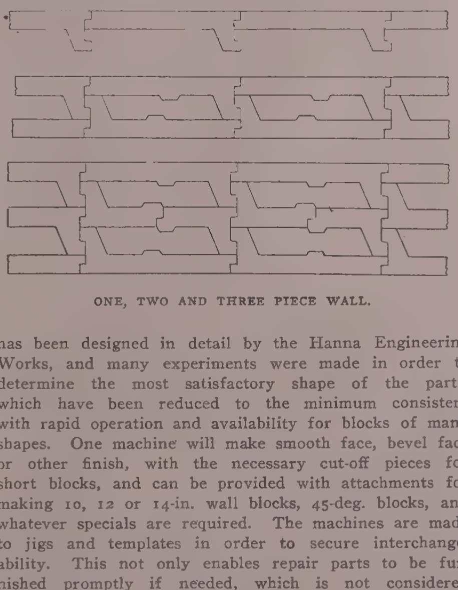
ACCIDENT TO A STEAM EXPANSION JOINT.

An unusual accident occured at the Paterson central station of the Public Service Corporation of New Jersey, by the failure of an expansion joint in a new steam line just erected. A 1,500-h.-p. vertical compound engine has been recently added to the equipment of the station and for supply of steam a 12-in. main had been run through from the boiler house adjoining, being carried from an elbow in a header in the boiler room through at right angles into the engine room. The extension in the engine room, which is carried on the side wall of the building and anchored near the engine throttle is over 100 ft. in length and was provided with an expansion joint of the slip type at a point near the boiler room header. The free side of the expansion joint was anchored to a partition wall by six bolts which had been proportioned for an ample factor of safety. On Dec. 5, the new line was being warmed up preparatory to admitting steam to the new engine when the slip joint failed, the short connection from that point to the boiler header flying around and knocking a small hole in the side wall of the building. A truck driver passing by outside was killed, but no further casualties were suffered. The station storage battery carried the load during the short time until matters could be righted in the boiler room for regular operation again.

The accident has left behind it an element of mystery as to its cause, as, owing to careful design and construction of the slip joint, any weakness in any of its parts seems improbable. It is practically certain that no water was encountered in the main, as the latter had been carefully warmed up and no evidences of water were noticed. The cause of the failure is therefore open only to conjecture. The opinion is favored by the officials of the company and others, that the packing of the slip joint which had been set up very tightly, had seized and held firmly to the slip portion of the joint throughout the lower range of pressures as the line was being warmed up, but when the pressure reached the maximum of 150 lb., had opened suddenly and with such a shock as to rupture tbe stay bolts by which the free end had been anchored to the partition wall. This view is favored by the fact that any one of the stay bolts was capable of withstanding the entire thrust upon the free end of the joint; if there were weakness in construction, it must have been present in all the bolts simultaneously, a rather unusual condition.

THE SHALL SYSTEM OF CONCRETE BLOCK CONSTRUCTION.

Visitors to Chicago interested in concrete block construction will find at the yard of the Hanna Engineering Works, 820 Elston Ave., an opportunity to inspect the manufacture of the Shall block for a three-story and basement apartment house in Logan Square. These blocks are the result of a study of concrete building construction with a view to securing absolutely waterproof and frostproof walls. In order to attain this end multiple-piece instead of single-piece blocks have been adopted, and these are laid up as shown in the accompanying diagram. The interlocking feature of the block is considered an important element of the design by the inventor, as it materially assists the workmen in laying up the wall. There is a continuous air passage, both vertically and horizontally, in the wall, assisting in keeping the inner part dry, and as the inner blocks are entirely separate from those on the outside, except where there is a thin layer of mortar, it is believed that the construction is as weather-proof as it is possible to make a wall. It is also believed that the plaster finish can be placed directly on the inner face, without lathing, owing to the freedom of the inner part of the section from expansion and contraction. The shape of the block is such that the molds are easily tamped, and as the block weighs only 35 lb. it can be handled by the masons without difficulty.



ONE, TWO AND THREE PIECE WALL.

The machine in which the blocks are manufactured has been designed in detail by the Hanna Engineering Works, and many experiments were made in order to determine the most satisfactory shape of the parts, which have been reduced to the minimum consistent with rapid operation and availability for blocks of many shapes. One machine will make smooth face, bevel face or other finish, with the necessary cut-off pieces for short blocks, and can be provided with attachments for making 10, 12 or 14-in. wall blocks, 45-deg. blocks, and whatever specials are required. The machines are made to jigs and templates in order to secure interchangeability. This not only enables repair parts to be furnished promptly if needed, which is not considered likely in view of the thorough trying-out of the machine in severe service before adopting its final proportions, but also enables any number of machines to be used in making blocks for the same building, since they will all be exactly alike in size. The blocks are made on 30 x 8 x 2-in. pallets of wood, costing about 7 cents apiece, so that the expense for this important part of a concrete block outfit is very small.

STANDARD FIRE TESTS OF FLOORS.

At a recent meeting of Committee P on Fireproofing, of the American Society for Testing Materials, it was decided to consider for the present the establishment of a standard fire test for fireproof floors only. For this purpose, the Committee will endeavor to collect all available data on fire tests of fireproof floors and information resulting from the study of fires and conflagrations, more particularly as to the temperatures reached and the duration of same. It is proposed to analyze and study this information and then publish it, with the hope of drawing forth suggestions and criticism from all who may be interested.

It is the earnest desire of the Committee to make the record of past tests as complete as possible, and it will greatly appreciate the kindness of those who may possess such information if they will take the trouble to forward it to the Committee. Such information may be sent to Prof. Ira H. Woolson, chairman of the Committee, at Columbia University, or to Mr. R. P. Miller, its secretary, 141 East 40th St., New York. If copies of reports cannot be forwarded, reference to the journals in which the reports have appeared may be given.

THE CINCINNATI, HAMILTON & DAYTON FIASCO.

There have been few proceedings more amusing to the outsider than recent developments in the Erie and Cincinnati, Hamilton & Dayton dicker. As announced in this journal on Sept. 23, the Erie R. R. Co. bought a majority of the stock of the Cincinnati, Hamilton & Dayton Ry., which had previously secured control of the Pere Marquette R. R. and the Chicago, Cincinnati & Louisville Ry. When the purchase was made the Erie people believed they were securing a valuable railway property, but a short investigation revealed the alarming fact that they had acquired a rather inferior grade of gold brick. This knowledge would have led to considerable distrust had not that eminent judge of railway values, Mr. J. Pierpont Morgan, been equally misled as to the nature of the C., H. & D. outstanding obligations. He acted with customary promptness, taking the new acquisition from the Erie company at the price they paid for it, and securing a receiver for the property. It will now be reorganized and developed so far as possible, and will doubtless emerge from its temporary cloud of ill repute into a position of good standing, for it is mainly made up of lines which fill legitimate transportation needs. In the application for a receiver the following statements were made:

The defendant company was solvent prior to July 7, 1904, when it came under a different controlling influence, and assumed large obligations, one of these being the purchase of 110,000 shares of Pere Marquette stock for $125,000,000; second, a tripartite agreement among the defendant, the Pere Marquette and the Toledo Railway and Terminal Company, involving large obligations for terminals at Toledo, and, third, an agreement to carry $3,500,000 bonds issued by the Pere Marquette to cover its purchase of the Chicago, Cincinnati and Louisville Ry.

Since July 7, 1904, the funded debt has been increased more than $25,000,000, carrying an increase in the fixed charges of over $1,000,000 (exclusive of further annual fixed charges of $578,000 on the lease of the Pere Marquette), and also the floating debt has been increased until it exceeds $6,000,000.

The defendant has no property to present as security; has no credit; is unable to secure funds, while a number of suits by creditors are sure to be started within a short time.

The funded debt of the defendant company and its constituent companies on December 1, 1905, was upward of $69,000,000. The funded debt of the Pere Marquette and constituent companies was upward of $54,000,000; that of the Chicago, Cincinnati and Louisville was more than $6,500,000 and that of the Toledo Railway and Terminal Company was $3,500,000. The floating debt of the defendant company was $6,625,000, exclusive of judgments to the amount of more than $50,000.

The cash assets of the defendant at the close of business on December 2, 1905, including the cash assets of the Pere Marquette, amounted to less than $100,000. On January 1, 1906, there will be due interest on the 4 per cent. Pere Marquette bonds, which were issued for the purchase of the Chicago, Cincinnati and Louisville Railway and assumed by the defendant company; but the defendant had no funds with which to pay such interest.

Fixed charges due, or about to become due, amount to $5,000,000, for which the estimated December earnings of $1,625,000, not more than $50,000 in bills receivable and not more than $100,000 cash were available.

The Missouri River Power Transmission Co., Helena, Mont., is erecting a steam station as a reserve to its water-power plant. Two 2,000-kw. Westinghouse-Parsons units will be installed, running at 1,200 r.p.m., with 150 lb. steam pressure, 100° superheat and 28-in. vacuum.

The October shipments from the East Pittsburg works of the Westinghouse Electric & Mfg. Co. amounted to over 5,000 separate consignments, weighing approximately 8,500 tons. Among them were a 1,200-kw. alternator and three 500-kw. oil transformers, forming the second of a series of shipments for the Kauia Island plant of the Hawaiian Electric Co., of Honolulu.

NOTES ON AIR LIFTS FOR RAISING WATER.

It is well known among hydraulic engineers that pioneer work in developing and introducing the air lift system of raising water was done by the Ingersoll-Sergeant Drill Co. Beginning with the system designed by Dr. Julius J. Pohlé it has developed its capabilities and those of other systems, until the company now recommends the air lift for many conditions that would not have been considered favorable for it ten years ago. From the manual on lifting water by compressed air just issued by the company, the folowing notes have been taken to show its present opinions on some features of such plants:

Theory of the Air Lift.—Opinions differ as to the true theory of the air lift. A common case is a driven well in which the water has risen approximately near the surface. We place in this well a large pipe for the discharge of the water. This is known as an "eduction pipe." This pipe does not touch the bottom of the well, but is elevated above it so as to freely admit the water through its lower open end. Alongside of this pipe, either on the outside or within, is a small pipe properly proportioned and intended to convey compressed air to a point near the bottom of the eduction pipe. It is usual to provide what is called a "foot piece," which forms the nozzle connecting the air pipe with the water pipe, but in what is known as the "central pipe system" this foot piece is not used, the air pipe being placed within the eduction pipe to a point near the bottom, where it discharges the compressed air into the water column.

The air pipe is connected with an air receiver on the surface, which is in or near the engine room, in which there is an air compressor. This air pipe is provided with a valve on the surface. Before turning on the air the conditions in the well show water at the same level on the outside and inside of the eduction pipe. At the first operation we must have sufficient air pressure to discharge the column of water which stands in the eduction pipe. This goes out en masse, after which the pump assumes a normal condition, the air pressure being lowered and standing at such a point as corresponds with the normal conditions in the well. This is determined by the volume of water which the well will yield in a certain time and the elevation to which the water is discharged. Here comes in the value of experience in laying out the pipes, which should be proportioned to meet normal conditions.

The Frizell System.—It was at first supposed that in all air lift cases the water was discharged because of the aeration of the water in the eduction pipe, due to the intimate commingling of air and water. Bubbles of air rising in a water column not only have a tendency to carry particles of water with the air, but the column is made lighter, and, with a submergence or weight of water on the outside of the eduction pipe, there would naturally be a constant discharge of air and water. This is known as the Frizell system, and where the lifts are moderate—that is, where the water in the well reaches a point near the surface—it is very likely that the discharge is due to simple aeration.

Piston-Like Layers.—Most air lift propositions are deep well cases—that is, the water is lifted a distance greater than 25 ft.; and just in proportion as the lift is increased do we get away from the aerated form idea and reach the Pohlé system of piston-like layers. To understand the distinction and the importance of proper pipe proportions let us take an exaggerated case, where we have a lift of, say, 100 ft. and a diameter of eduction pipe of 12 ft. Such a case as this is impracticable, and no matter how much air is discharged into this pipe it is likely to rise in the shape of bubbles, some of them larger than others, because as they ascend they cohere; but piston-like layers can only be formed in so large a pipe as this under conditions where there is a sufficient head or height of discharge and an enormous volume of water. In other words, the volume of water admitted to this pipe of large diameter must be sufficient to keep pace with the large volume of air admitted.

The economy of the air lift system is in direct proportion to the capacity of the well to form piston-like layers, and the reason why these layers are formed is that after the first discharge there is kept up a constant struggle between the air under pressure and the head of water on the outside of the pipe, each one seeking to enter the lower end of the eduction pipe. When the air pressure is greater than the head of water a certain volume of compressed air is admitted into the eduction pipe. The water in this pipe is at that time moving rapidly upward; that is, its momentum has been established. Hence the air takes up this velocity and goes upward with the water. If a sufficient quantity of air has been admitted in proportion to the diameter of the pipe, and if there is a sufficient pressure in this pipe to prevent the free discharge of the air, we can see how readily this bubble of air spreads itself across the diameter of the pipe in a piston-like condition. The reason why this air piston is not elongated and continuous is that the free discharge of the air, aided by the velocity with which everything in the eduction pipe is moving, causes a fall in the air pressure just sufficient to allow the head of water to press the water into the air space from the open end of the eduction pipe. In other words, as the air pressure is slightly lowered, the water pressure, which was nearly equal to the air pressure, becomes a little greater and a piston-like layer of water enters the pipe, shutting off the air. This "chunk" of water rises in the eduction pipe with velocity equal to that of the air, and, as it has plugged off the air nozzle, there is a momentary rest, during which the air has a chance to accumulate greater pressure, and just as soon as its pressure overcomes that of the water the conditions are reversed and another "chunk" of compressed air is discharged into the pipe, shutting off the water for an instant. This process is continuous and as regular as the movement of a pendulum.

As these "chunks" of air approach the surface they are gradually enlarged, because of the reduced load upon them, and it is likely that before they reach the surface there is a general breaking up of the piston-like layer conditions; but it is important that each plant should be installed with the idea of maintaining the piston-like layers as far as may be possible.

Economy.—It is natural that at first the air lift system should have been lacking in the efficiency now possible. Its rapid growth in favor everywhere shows a foundation of solid merit and an adaptability to certain conditions which no other pumping system can meet so well. Some have thought the system lacking in economy, but their judgment rests on results obtained with improper methods of well piping in connection with inefficient compressors, from which satisfactory results on a "foot-pound duty" standard could not be expected. The superior air compressor of to-day operates with a half or quarter of the fuel for a given power formerly required. Refinements in well piping and a better understanding of conditions have reduced both the pressure and the volume of air needed. There are now so many successful plants at work, meeting all the different conditions of volume and lift, that the design is reduced to a scientific basis.

An air lift test was recently made in Indiana which affords an opportunity for comparison between the efficiency of the air lift system of pumping and one of the best and most economical deep well pumps made. This Indiana water works for over a year used a second-hand 16 and 18¼ x 18-in. class "A" Ingersoll-Sergeant compressor to operate an air lift furnishing a temporary water supply. Recently the pump company obtained permission to make a test, and installed two of its belt-driven pumps, with cranks and pitman, giving a double-acting effect with a definite length of stroke. In this case the pumps were driven by an ordinary portable engine and boiler. The test was conducted by a well-known consulting engineer, who was employed by the city to make tests to determine which system should be adopted. As a result of these tests, which were very thoroughly made, it was definitely shown that the deep well pump raised 60 gal. of water per pound of coal burned under the boiler, while the air lift plant, under the same conditions, raised 300 gal. per pound of coal burned.

These tests were unbiased and reliable, and afford an idea of the relative efficiencies under like conditions. Admitting a much higher efficiency for the pump in cases where economical engines are used, it should also be borne in mind that the efficiency of the air lift plant can be increased by using Corliss compound compressors, and that a power-driven deep-well pump such as was used in this case is much more efficient than the more usual type, which is driven by a direct-connected steam head, so that the comparison would be about the same for average conditions.

Cost of Pumping with the Air Lift.—This question is usually asked without giving several items which largely determine the answer. Thus, coal at $2 is one thing, at $4 another. Again, some wells are nearby and in other plants the pipe investment is greater because of scattered wells. Speaking generally, the average cost per thousand gallons pumped depends on the size of plant and height of lift. In a 4,000,000-gal. plant, with a 50-ft. lift, it is about ⅓c. per 1,000 gal. In a larger plant, with a 35-ft. lift, with coal at $2, it is about 1⅓ mills. In another case, where the lift is 75 ft. and the capacity 1⅓ million gal., the cost is 1c. per 1,000 gal., coal costing $2. In a plant pumping 3,000,000 gal. 75 ft. high, the cost is 4.5c., and where the lift is 50 ft. 3.5c. In Pennsylvania, a plant giving 175 gal. per minute at 75-ft. lift, costs 1⅓c. per 1,000 gal. In a proposed municipal plant 100,000,000 gal. per 24 hours, 50-ft. lift, and with coal at $1.50 a ton, the cost figured 1 mill per 1,000 gal., including all fixed and operating expenses. In another case, involving the handling of about 15,000,000 gal. of water 30 ft. high every 24 hours, using compound condensing compressors, and with coal at $2 per ton, other figures being estimated on a very generous basis, the cost nets about $2.50 per 1,000,000 gal., or about 2½ mills per 1,000 gal. These figures cover fuel, oil, labor, sinking fund, interest and taxes.

In many cases the introduction of the air lift may be effected at little expense, often involving the purchase only of an air compressor, a receiver, and a small amount of pipe, but the following is estimated on a basis which will cover the greatest amount of expense likely to be incurred, with a view of showing particularly that the interest and depreciation charges under the most extreme conditions are not likely to develop into formidable figures. The following is a list of the complete equipment for an air lift plant to raise 1,500,000 gal. per 20 hours, or 1,250 gal. per minute. Total lift, 75 ft.: Air compressor, complete, ready for foundation and piping. Air receiver. Boiler, 85 h.p., with feed pumps, etc., bricked up and ready for use, including building and value of ground so occupied. Tank, 19,000 gal. capacity, including suitable timber framework to bring tank 75 ft. above water level. Two 12-in. wells, each 135 ft. deep, cased. Casing, 450 ft. 7⅝ in. light pipe. Air pipe, 500 ft. of 3-in., air pipe in wells. Air pipe, 1,000 ft. of 4-in. air line from receiver to wells. Water pipe, 1,250 ft. of 12 10 and 8-in. cast-iron distributing main, leaded joints, from tank to works, laid below frost (air line laid in same trench). All other pipe and fittings. Compressor, receiver and tank foundations laid in cement. Excavation for foundation. Special automatic governing mechanism. Total estimated cost of complete plant, ready to run, as above, $8,750. This is intended to include everything which may be considered as a legitimate expense in this connection. In many cases the buildings, boilers, tanks, wells, pipe lines, ground space, and other items do not represent a present expense, being already on the ground.

We may estimate the cost of operation as follows: Engineer, double shift, at $2.25 per day, $4.50, ⅕ time chargeable to pumping plant, per day, $0.90; Fireman, double shift, at $1.75 per day, $3.50, on the basis of one man required for each 250 h.p. of boiler for 85 h.p. per day, $1.19; fuel, 85 h.p., 20 hours, say 4¼ tons, at $2 per ton, per day, $8.50; oil, waste and sundries, say, 60 cents; interest on investment of $8,750 at 5 per cent., figuring eleven 25-day months, or 275 working days per year, per day, $1.91; deterioration, covering sinking fund, repairs, etc., providing for renewal of complete plant every ten years same basis as interest but 10 per cent., per day, $3.18; insurance and taxes at 1 per cent., as above, per day, 32 cents; total estimate cost of pumping 1,500,000 gal. per day, 75 ft. high, under the above conditions, $16.60. Cost of each 1,000 gal. ($16.60 ÷ 1,500) = $0.01107.

Limitations of the System—There is no limit as to the quantity that can be handled, except the capacity of the wells to furnish the water.

With a properly designed piping system the loss of power in the transmission of compressed air is trifling, and compares very favorably with any other method. It varies practically as the distance—that is, the loss in four miles is approximately twice that for two miles, with the same size pipe. With electricity, the loss would be four times, or as the square of the distance. As the air lift pump is automatic in its action there is no objection to having the source of water supply at a distance from the power station. There are successful plants in the oil country where areas of ten square miles are supplied through over forty miles of air lines from one central plant. It is claimed that one of these burns 85 per cent. less fuel than was formerly required for the 375 working wells operated.

There seems to be a prevailing idea that the air lift system is not adapted for lifts of much more than about 200 ft. vertically, but this is far from being well founded. There are more than twenty plants in one oil field pumping a mixture of salt water and oil on actual lifts of from 600 to 1,200 ft., in most cases with an air pressure of less than ⅓ pound per foot of actual lift, and in some cases less than ¼ pound. In the Rocky Mountains there is an air lift working at a mine, taking air from a high pressure pneumatic locomotive service main and lifting 160 gal. of water per minute, more than 700 ft. vertically. All the air that this pump gets passes through a 5-32-in. round hole drilled in a solid plug cock. These are regular air lift plants, without any valves or working parts in the well.

The fact is that the air lift pump is especially adapted to very high lifts, because it is under these conditions that all forms of deep well pumps give the most trouble from broken rods, valves and pipes, and the lowest efficiency, owing to friction and leaking leathers and valves. The percentage of submergence means the percentage of the total vertical air lift column (measured vertically from the point of air admission at the bottom to the point of water discharge at the top) which is submerged in the solid liquid column in the well when pumping. Neither the liquid level in the well when not pumping, nor the depth of the well, nor the level of the surface of the ground necessarily affects the submergence percentage, because when the pump is started the liquid level may fall 2 ft. or 200; the point of discharge may be 10 ft. below the ground surface or 100 ft. above; and the well may be 1,000 ft. deep, with the pipes extending only 200 ft. down.

For example, with a well 800 ft. deep, pumping water level 300 ft. below, and point of discharge 100 ft. above the surface, the pipes extending 700 ft. below the ground surface, the total vertical height of the column is 800 ft., and the submergence 400 ft. or 50 per cent., the lift being the same, a favorable condition for satisfactory work. We have plants working satisfactorily, under special conditions, on less than 30 per cent. submergence, and some with over 75 per cent., but usually the best economy is attained when it is about 60 per cent.

Methods of Piping Wells.—All wells are not alike, and consequently the method of piping which might properly be applied to one would be unsuited to another. Each well represents a problem requiring special study.

In the Pohlé or side inlet, the air and water pipes are placed alongside of each other in the well, and connected at the bottom with an end piece. This method should be used when the well is sufficiently large to admit of the air and water pipes being placed side by side from top to bottom. This is the most economical system, and its advantages are marked at medium and high lifts. The size of air pipe in well depends upon its length, and the volume and pressure of air to be used.

In some instances a well does not admit the use of the side inlet system, when the Saunders air lift system may be used. A central tube is suspended inside the well while the air passes down between it and the well casing. The water is then discharged through the central tube. Where the well is not cased a special pipe of less diameter than the well is inserted to a point reaching to a suitable depth and air inlet and discharge pipes are inserted. In the case of salt wells with a natural flow, or those in which water is pumped down to dissolve the salt, and later is raised as brine, the Ingersoll-Sergeant Co. advises the use of this system.

The third or central air pipe system reverses the arrangement already described, and is used to obtain the greatest possible output for a given size of well-casing, provided the well is cased to admit of a 50 per cent. submergence of the air pipe, which is suspended inside. The air passes down the central pipe, the water and air discharging between the air pipe and the well casing. The size of the air pipe depends on length and volume of air it is to carry and pressure. This is not as economical as the first and second methods, but may be used where the well is very strong and a great deal of water is wanted from a few wells.

Where a part of the water only is used at a high elevation about the works, it is an easy matter to put in a supplementary air lift, taking its supply from the distributing main and raising it in a second or compound lift to the point desired, thus avoiding the expense of raising the whole volume of water to the full height. When wells are shallow, not large in capacity, and the lift high for the submergence under ordinary methods, we have secured successful "compound" results by raising the water to the surface, allowing it to flow by gravity into one well near the tank, thus supplying the necessary submergence to give the higher tank delivery.

Arrangement of Wells and Piping.—Proper piping up of wells is a feature counting largely in the success of an air lift system, whether working one or several scattered wells. The introduction of unnecessary valves, elbows, angles and bends will cause a loss of air pressure, cut down the efficiency of the plant very largely, and should be avoided as far as possible. It is therefore well to lay out before hand the wells and piping, placing the wells and reservoir so that pipes can be run direct, with the fewest possible bends, elbows and valves. Pipes should all be made of a size sufficient to carry air to the wells and the water away with the least practicable resistance.

The use of long sweep elbows and tees is recommended, especially for water. In many cases elbows can be avoided by making long bends of pipes. If this is done the bends should be made smooth, regular and free from dents or kinks.

In laying out and piping up an air lift system the horizontal distance to which the discharge is conveyed by air should be made as short as possible. Thirty to fifty feet may be taken as the practical limit for satisfactory results. In special cases this has been considerably exceeded, but the Ingersoll-Sergeant Company does not recommend anything beyond the figures given without a full knowledge of the case.

Sometimes it is possible to discharge each well into a small cistern, barrel or enlarged vertical pipe of suitable elevation, from which it flows by gravity through a pipe to a central reservoir from which it may then be forced directly into the service main, or to an elevated stand pipe or tank by either a piston pump driven by air or steam, or by a pneumatic displacement pump. In some cases where there are but few wells, near together, it is simpler to discharge the air lift directly into a tank of sufficient elevation to give the desired pressure.

When running several wells together which require different air pressures, engineers sometimes put throttle valves on all the wells and in regulating them too finely raise the receiver pressure to a point far above that required to run the highest pressure well. All this excess pressure represents power thrown away, and the practice should not be allowed. It is in such cases necessary to have throttle valves on all the low pressure wells and often to have them nearly shut, but the well that requires the highest pressure to operate it should be run with the valve wide open, or nearly so, and then the other wells regulated to take what air they need, forcing the rest of it to the high pressure well.

An ordinary globe valve proves to be the best regulating valve except for very high pressures. Gate valves or plug cocks cannot be regulated as closely and cannot be so readily set at the same point after having been closed. A second globe valve may be used for stopping and starting, thus leaving the economical adjustment of the regulating valve undisturbed.

BUSINESS NOTES.

The John A. Roebling's Sons Co. has completed the hawsers to be used in towing the dry-dock Dewey from Sparrows Point to Olangapo, P. I. Each hawser is 1,200 ft. long, 2 in. in diameter and composed of 222 wires divided into six strands of 37 wires each, twisted around a hemp core.

After continuous test of the Sturtevant economizer at its Maynard mill, the American Woolen Co. has ordered two more machines from the B. F. Sturtevant Co., Boston, for the equipment of the Wood worsted mills, at Lawrence. This will probably be the largest woolen manufactory in the world. Other recent orders for Sturtevant economizers have come from the Singer Mfg. Co., Elizabethport, N. J.; Springville Mfg. Co., Rockville, Conn.; Nashua Mfg. Co., Nashua, N. H.

The Ohio Quarries Co., of North Amherst, Ohio, and the Bedford Quarries Co., of Bedford, Ind., have just placed an order for ten Sullivan channeling machines for the Bedford quarries, and eight for the North Amherst quarries. These machines are of the class Y single hang, steam-driven type, with 7-in. cylinder, especially adapted for use in the oolitic limestone of the Bloomington and Bedford districts, and the sandstone of Northern Ohio. The Ohio Quarries Co. already has in operation eight Sullivan Y channeling machines at its North Amherst quarries, while ten machines of the same type are in use at the Bedford Quarries Co.'s operations at Bedford, Ind. The Consolidated Stone Co. has also ordered four of the new class Y Sullivan oolitic type channelers with 8-in. cylinders for use at its quarries at Bloomington and Bedford, making 21 Sullivan machines at these two properties. The New York office of the Sullivan Machinery Co. has also secured from F. A. Maselli & Co., an order for two class Y-8 channelers and several rock drills, for use at Rochester, N. Y., on the Erie Canal improvements.

The Oswego Boiler Works at Oswego, N. Y., has been purchased by New York parties understood to be associated with the A. D. Granger Co., 95 Liberty St., New York, with branches at Philadelphia and Pittsburg. The plant, which occupies about twenty acres on the lake front, was established some twelve years ago, and it is expected will be placed in active operation at once. Steel plate work in all branches, including boilers, tanks and stacks, will be manufactured. The new company will be known as the Oswego Boiler & Engine Co., with the main office at Oswego.

Mr. T. M. Simpson, for several years past manager of the Philadelphia office of A. D. Granger & Co., has been appointed district sales manager for the Weber Steel-Concrete Chimney Co., with offices at 1632 Land Title Building, Philadelphia. Mr. Simpson will have charge of the Philadelphia territory and the Atlantic Coast states. Owing to the large increase in the company's business, it anticipates establishing an office in New York within the next few weeks.

The Wm. B. Scaife & Sons Co., Pittsburg, Pa., has received a contract from the Pittsburg Railways Co., for a steel frame trestle and viaduct 455 ft. long, varying from 30 to 101 ft. high, with girder spans from 26 to 90 ft. The trestle is to be erected over Lowry's Run, near Emsworth, Pa.

The Fairbanks Co., whose warehouse at 19 Light St., Baltimore, was burned on Feb. 7, 1904, and later lost its temporary warehouse at 314 North St., in the same way, has moved into a large building at Lombard, Light and Water Sts.

Recent orders closed by the York Mfg. Co., York, Pa., include a 50-ton ice plant for the Rocky Mount Ice & Fuel Co., Rocky Mount, N. C.; two 125-ton refrigerating machines and a 60-ton ice plant for the Ohio & Pittsburg Milk Co., Pittsburg, Pa.; a 6-ton ice plant for W. K. Osteen, Denmark, S. C.; a 25-ton ice plant for the Peoples Ice & Fuel Co., Phoenix, Ariz.; a 25-ton ice plant for the Home Ice Factory, Mobile, Ala.; a 6-ton ice plant for the Welaka Ice Co., Welaka, Fla.; a 15-ton ice plant for the Crystal Ice Co., Las Vegas, N. Mex.; a 6-ton refrigerating plant for Huntington, W. Va.; a 175-ton horizontal double-acting machine for the Heermance Storage & Refrigerating Co., New York; a 120-ton ice plant for the Polar Wave Ice & Fuel Co., St. Louis, Mo.; a 20-ton refrigerating plant for the Minneapolis Milk Co., Minneapolis; a 15-ton ice machine for J. J. Wensley, Wharton, Tex.; a 125-ton compression side for the Du Quoin Ice & Cold Storage Co., Du Quoin, Ill.; a 10-ton refrigerating plant for Geo. M. Oyster, Washington, D. C.; a 35-ton ice plant and 20-ton refrigerating machine for the Merchants Ice & Cold Storage Co., Los Angeles; a 250-ton refrigerating machine for Schwarzscbild & Sulzberger, Chicago; a 30-ton refrigerating plant for the Ward-Corby Co., Pittsburg, for its Cambridge branch; a 15-ton ice plant for the Mt. Pleasant Ice Co., Mt. Pleasant, Pa.; a 20-ton compression side and a 6-ton ice plant for Agar Cross & Co., New York; a 30-ton ice plant for C. M. Chrissifidis, Piree, Greece; a 1-ton ice plant for Frederick Probst, New York; a 50-ton absorption system plate plant for P. P. Keller, Asbury Park, N. J.; two 100-ton absorption plants for A. Booth & Co., St. Paul.

PERSONAL NOTES.

Mr. A. B. Ford has been appointed master mechanic of the Minot division of the Great Northern Ry.

Mr. Robert Moore has been appointed consulting engineer of the Municipal Bridge and Terminal Commission of St. Louis.

Mr. F. R. Layng has been appointed engineer of bridges of the Bessemer & Lake Erie R. R., with offices at Greenville, Pa.

Mr. W. B. Bates, of Richmond, has been elected city engineer of Roanoke, Va., succeeding Capt. J. H. Wingate, resigned.

Dr. C. D. Walcott, director of the U. S. Geological Survey, has been awarded the Hayden memorial medal of the National Academy of Science.

Mr. H. H. Lotter, assistant engineer on the Thebes bridge, has been appointed assistant engineer on the Columbia and Willamette bridges of the Portland & Seattle Ry.; his address is Vancouver, Wash.

Messrs. A. F. Hewitt and R. C. Carstarphen have formed the Hewitt-Carstarphen Co., with offices in the McPhee Bldg., Denver, and will specialize in metallurgical and mill work.

Mr. L. F. Lonnbladh, chief engineer of the Tennessee Central R. R., has resigned to become superintendent of construction of the Southern Ry., with offices at Nashville.

Mr. Desmond Dunne, an advertising agent, has been appointed commissioner of public works of the Borough of Brooklyn, New York City, by the recently elected borough president, Mr. Bird S. Coler.

Mr. Charles A. Olsen, formerly superintendent of the St. Petersburg shops of the Societe Anonyme Westinghouse and for several years head of the flanged fitting department of Crane & Co., Chicago, has been appointed general superintendent of the latter company.

On Jan. 19 a civil service examination will be held in Chicago to fill the position of chief harbor engineer. The successful candidate will have full charge, under the Commissioner of Public Works, of the city's harbor inspection, bridge building, surveying and architectural work.

Mr. T. C. Phillips, of the city engineer's department of Chicago, has been assigned to special work in connection with the extensions of the water mains, and his former duties as supervisor of the operation of pumping stations will be taken over by Mr. William J. Burns, now chief engineer of the East Chicago Ave. station.

Samuel Lawrence Minot, who died in Malden, on Nov. 28, was a descendant of a colonist who settled in Dorchester in 1630. He was born in Maine in 1826, and after taking a full course at Philips Academy, Andover, entered the engineering office of the late Thomas Doane. Afterwards he was successively employed as assistant engineer of the Charles River R. R., engineer in charge of location and construction of the Newport extension of the Old Colony R. R., chief engineer of the Boston & Providence R. R., and engineer of construction of the Providence division of the Old Colony R. R. He was also the consulting engineer of the Boston & Lowell R. R. under its lease to the Boston & Maine R. R.

Gabriel Leverich, who died in Brooklyn, last week, was widely known among the older members of the American Society of Civil Engineers on account of his six years' service as its secretary, his term expiring in 1877. He was a graduate of the Rensselaer Polytechnic Institute, and was engaged for some years in ordnance manufacture and bridge construction. He joined the staff of the Brooklyn bridge in 1878 and was actively connected with the construction, operation and maintenance of this structure for twenty-two years, until failing health compelled him to resign. The mechanical equipment was under his direct supervision and the excellent manner in which it stood the test of severe trials is proof of his engineering ability. Personally Mr. Leverich was a man of unusually scholarly attainments for an engineer, and his discussions of engineering subjects were marked by their English style as well as their technical information.

Robert Whitehead, who died last month at Beckett Park, England, was a man of the kindliest nature, whose invention and development of the torpedo bearing his name in no way indicated to those unacquainted with him his abhorrence of war. He was essentially a captain of peaceful industry. Born in 1823, he was apprenticed in 1837 to a Manchester machine shop. When this apprenticeship was completed he worked for three years in shops at Marseilles, and then opened his own works at Milan. The revolution of 1848 led him to abandon this venture and move first to Trieste and afterward to Fiume, where he designed and built several engines for vessels of the Austrian navy. One of the Austrian officers suggested the idea which was developed into the famous torpedo. The first was built in 1866, but was lost before it was officially tested. The second, completed in 1868, was accepted by the Austrian authorities. It had a speed of 8 knots and a range of 800 yards. The present type has a speed of 36 knots and a range of 4,000 yards, facts that epitomize its great improvements. Most of these weapons are made at the Whitehead works at Fiume, managed by a son of the founder, although there is a large establishment for their production at Weymouth, England.

The appointment of Mr. F. A. Molitor as the government's supervising engineer on the railways to be built in the Philippines, is a thoroughly good one, and ensures the highest measure of engineering and executive abilty on the side of the insular authorities. The position is that held by Mr. John F. Stevens before his appointment as chief engineer of the Isthmian Canal Commission, and it would be difficult to find anybody better fitted than Mr. Molitor to take up the work. He has been engaged for a good many years doing excellent work in the Southwest. To engineers generally he has been known as the general manager of the Midland Valley R. R. and the chief engineer of the Cherokee Construction Co., but in railway circles he has had a very definite and high rank as one of the younger men who have been doing high-grade work efficiently and economically. The people who receive the concessions for the Philippine railroads are also to be congratulated on this appointment, for it will mean fair treatment for them and intelligent appreciation of their difficulties. In this connection a quotation from some directions issued by Mr. Molitor a few years ago is pertinent: "Resident engineers in their dealings with the contractors are expected to follow a courteous, businesslike and ethical course; to recollect that it is the contractors' business to make all the money possible. Resident engineers are not on the work to prevent this, but to see that the contractors perform their work in strict accordance with the specifications, plans and contract."

Major John Biddle, Corps of Engineers, U. S. A., is understood to be certain of reappointment as Engineer Commissioner of the District of Columbia, although he has served a four-year term. There are a number of important engineering works in progress in the District and strong attempts have been made to secure Major Biddle's retention in office until their completion. The following letter from Commissioner Macfarland to General Mackenzie, Chief of Engineers, needs no comment: "Referring to my recent conversation with you, permit me to say more formally that it would be prejudicial to the interests of the District of Columbia to relieve Col. Biddle from the duties of Engineer Commissioner at this time and that he ought to continue in the office, at least until the great projects of municipal improvement now in operation are completed. His relation to all those projects has been so intimate and so important that no one else, however able or experienced, would do so well what he is doing. May I add that in all his administration of the office, he has shown, besides genuine ability and engineering skill, unusual judgment and tact and that he has had remarkable success in dealing with most difficult problems. We have been fortunate in our Engineer Commissioners, but we have been especially fortunate in the present one. In his dealings with the citizens he has been very acceptable and I feel sure that I represent their views, as well as those of the District government, when I repeat that the District's interests require that Col. Biddle should be continued as Engineer Commissioner."

The following candidates for admission to the American Society of Civil Engineers were elected Dec. 6. As Members: Hermann Alber, Birmingham, Ala.; A. S. Baldwin, chf. engr., Illinois Central R. R., Chicago, Ill.; C. L. Carpenter, asst. engr., Isthmian Canal Commission, Matachin, Canal Zone, Panama; W. B. Clapp, engr., U. S. Geological Survey, Los Angeles, Cal.; T. B. Ford, Bridgeport, Conn.; J. D. Galloway, cons. civ. engr., San Francisco, Cal.; G. A. Gilfillan, Pittsburg, Pa.; A. W. Newton, engr., Missouri district, Chicago, Burlington & Quincy R. R., St. Louis, Mo.; F. L. Nicholson, engr. maintenance of way and structures, Norfolk & Southern R. R., Norfolk, Va.; O. E. Parks, town engr. and engr. of water works, Westfield, Mass.; F. C. Warner, U. S. asst. engr., Engr. Dept., U. S. A., Delaware City, Del.; F. J. Wood, chf. engr., Boston, Pawtucket & Providence Street Ry. Co., cons. engr., Norfolk & Bristol Street Ry. Co., Foxboro, Mass. As Associate Members: R. E. Adams, civ. engr., office of the Quartermaster General, Washington, D. C.; E. R. B. Allardice, div. engr., Metropolitan Water and Sewerage Board, Clinton, Mass.; E. Y. Allen, asst. resident engr., Bergen Hills Tunnels Section, North River div., Pennsylvania, New York & Long Island R. R. Co., South Orange, N. J.; W. E. Barnes, mgr. and treas., Thermograde Valve Co., Boston, Mass.; C. M. Buck, office engr., Atchison, Topeka & Santa Fe R. R., Topeka, Kan.; J. E. Grady, engr. in charge of bridge construction on Chicago River for Sanitary District in Chicago, Chicago, Ill.; J. L. Gray, asst. supt. and engr. Paraffine Works and Acid Restoring Works, Tide Water Oil Co., Bayonne, N. J.; J. L. Hildreth, Jr., topographical draftsman, Bureau of Highways, Brooklyn, N. Y.; C. J. Hogue, engr. in charge of design and construction for Eastern Expanded Metal Co., Boston, Mass.; Wm. Meadowcroft, asst. engr., Bureau of Engineering, Government of the Philippine Islands, Iloilo, Panay; L. L. Melins, with New York State Engineering dept., Glenmont, N. Y.; O. M. Severson, div. engr., Buffalo & Susquehanna Ry., Buffalo, N. Y.; W. W. K. Sparrow, asst. engr., M. of W., Cape Government Railways, Queensland, Cape Colony, South Africa; C. W. Sutton, Lima, Peru; F. W. Tooker, with Chas. W. Leavitt, Jr., New York City; O. A. Wait, designing engr., Great Northern Power Co., Duluth, Minn.; R. A. Widdicombe, engr. and supt., Kroeschell Bros. Co., Chicago, Ill. As Associate: A. G. Patton, inspector, Philadelphia Fire Underwriters' Association, Philadelphia, Pa. The following candidates have been transferred from Associate Member to Member by the Board of Direction; G. M. Bacon, Salt Lake City, Utah; Werner Boecklin, West New Brighton, N. Y.; F. D. Leffingwell, Montclair, N. J.; E. W. McCornack, Mayari, Cuba; F. E. Winsor, Boston, Mass.

TRADE PUBLICATIONS.

A catalogue describing the design of alternating-current generators for use with water wheels has just been published by the National Electric Co., Milwaukee. Reliability is particularly essential in the equipment of hydro-electric plants, which are often in localities remote from the place where the current is used. The pamphlet describes in unusual detail the designs of the parts of its generators for such service, and contains numerous illustrations of them.

Drying has now become an important feature of the manufacturing processes in many industrial works and a considerable variety of equipment has been designed to treat different materials. In the new catalogue of the United States Drying Engineering Co., 66-70 Beaver St., New York, illustrations are given of indirect and direct dryers heated by furnace gases and steam and provided with different methods of feeding. The class of materials for which each dryer is fitted is explained and their general construction is illustrated.

The Publication Bureau of the General Electric Co., Schenectady, N. Y., has recently issued a number of pamphlets of diversified character. One of them describes what is called a luminous electric radiator; it has an ornamental cast-iron frame fitted with a polished copper reflector at the back and three or more large cylindrical heating lamps. The apparatus has been designed particularly for giving temporary heat on chilly days. Another pamphlet gives a facsimile reproduction of the report of Messrs. Sargent & Lundie on a test of a 2,000-kw. Curtis turbine. A third pamphlet is a reprint of a valuable paper on mercury arc rectifiers, read by P. D. Wagoner before the National Electric Light Association. Still another publication is a large catalogue of a great variety of railway line material and rail bonds, specialties to which the company has lately been giving much attention.

The luxury of the modern office building is reflected in a booklet published by the Triumph Ice Machine Co., Cincinnati, explaining its system of ice water supply from a small plant in the basement. For sake of illustration the equipment of the First National Bank Building is described, but the makers state that it is usually necessaray to design each installation for the special service conditions in the building. The booklet also contains a short description of the Triumph compressor.

The Perfection Block Machine Co. 501 Kasota Bldg., Minneapolis, has issued a folder describing a new machine for making hollow concrete building blocks. This is a power machine devised by Mr. W. L. Dow, and submits the blocks to a pressure of about 100 tons. The folder illustrates several plants equipped with the apparatus and contains letters from their owners.

Merritt & Co., 1022-1030 Ridge Ave., Philadelphia, have issued a pamphlet containing a large number of extracts from papers and books by various authorities relating to the place of oxidation in sewage purification. These quotations are cited to show the advantage of dividing sewage disposal plants into a liberal number of correctly designed units and of controlling the inflow and outflow of the sewage.

The great variety of forms in which ball and roller bearings are now manufactured is well shown by Catalogue 12 of the Standard Roller Bearing Co., Forty-eighth and Girard Ave., Philadelphia. In the past such bearings have not always given the results expected from them because they were designed by people not acquainted with all the requirements which must be satisfied in order to attain success. This 88-page book will be useful to designers of machinery, rolling stock, contractors' equipment and other apparatus where it is desirable to keep the friction losses down to a minimum. It not only illustrates a great number of standard bearings, but also describes many special applications of these balls and rollers.

Dry self-lubricating bearings are described in much detail in a book issued by the North American Metaline Co., West Ave. and Third St., Long Island City, N. Y. The material used as a lubricant in these bearings is a mixture of many materials, consolidated into a dense mass by hydraulic pressure. This metaline, as it is called, is then inserted in the face of a halved bushing, which should be made of gun metal bronze, phosphor bronze, a hard composition of copper and tin or the like. Babbitt metal, white metal and cast iron will not answer. These bearings are not claimed to be useful for all purposes, and are mainly employed in tackle blocks, rope sheaves, loose pulleys, friction clutch pulleys and other places where the bearings revolve around the shaft; for line and counter shaft boxes, floor stand boxes, fans, electric motors, the bearings of automobiles and other places.

The new catalogue of the Buffalo Steam Pump Co., Buffalo, N. Y., is arranged in two sections, the first devoted to steam and power types and the second to centrifugal types. The former are now made in a great variety of patterns and sizes, and the book contains illustrations of their parts and of the assembled machines, with tables of dimensions and capacities. In the portion of the book devoted to centrifugal pumps the ground is covered with unusual thoroughness. There are reports of tests, curves of performance, information concerning the design of details, and suggestions for the selection of pumps for different purposes. There are also complete tables of dimensions and capacities. An unusual feature of the tables is the fact that they give prices as well as dimensions.

The new book issued by the engineering department of the John A. Roebling's Sons Co., Trenton, N. J., is a beautifully printed description of many of the typical suspension bridges and cableways built by the company. Although the name of Roebling is generally associated with long-span structures of a monumental character, it should also be recognized as standing for the development of light suspension bridges for highway and industrial purposes, which are available in localities unsuited for truss bridges. The suspension bridge has been developed by this company for a great range of purposes, and this book will surprise many engineers who have not followed the extensive use of suspension structures at the present time. The section of the book on cableways and haulage systems shows plants employed in mining operations, industrial works, on contracts for sewers and reservoirs, in tunnels and for unloading cars and boats. A wide variety of equipment has been worked out for such diverse purposes, and the book explains in considerable detail by reference to actual installations the special advantages of each.

The Westinghouse Standard engine is now more than a quarter century old, but it nevertheless continues to keep its popularity for purposes where the use of a simple non-condensing engine is consistent with the principles of sound engineering and commercial economy. Where all the exhaust from an engine can be profitably used, it is mistaken economy to try to make that exhaust less, as the deficiency must be made up by practically the same amount of live steam drawn directly from the boilers. This fact is well recognized in many industries, and when it is coupled with the enclosed construction of this Standard engine, enabling it to run in places where the weather, dust or grit will injure the usual forms of engine, the reasons for its popularity are apparent. These facts are brought out clearly in a catalogue issued by the Westinghouse Machine Co., East Pittsburg, Pa., which describes the construction, gives tables of the actual commercial performance to be expected, and explains many of the manufacturing methods that are followed in the production of the engines.

The coal mining and handling machinery of the Jeffrey Mfg. Co., Columbus, Ohio, is well known for its great variety, and it will not be surprising to many readers to learn that the new catalogue issued by the company to cover this department of its business is a book of 142 pages. It describes and illustrates elevator and grab buckets, bucket elevators, cable and chain car hauls, rubber belting, many types of chain, coal tipple equipment, coal conveyors of a variety of systems, coal crushers, rock drills and cutters, washers, dump cars, elevators, mine hoists, hoisting tubs, locomotives, cars, screens, skip cars and other equipment too numerous to mention. The illustrations not only show the apparatus described but also give views of important installations of such machinery, making the book much more than a trade price list.

Some time ago the Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, acquired selling rights to the McKiernan rock drills, in order to extend its business in pneumatic machinery. It is now in a position to supply a great variety of such equipment, ranging from plug drills of the Chicago and Keller types to heavy quarrying and mining drills, together with compressors for furnishing the air. The range of types displayed by the company's apparatus is well shown in its new Catalogue 18, devoted to rock drills and auxiliaries.

CONTRACTING NEWS

OF SPECIAL INTEREST TO CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Osceola, Ark.—It is reported that W. E. Ayres, of Memphis, Tenn., has completed estimates for the construction of a $30,000 water system.

**Denver, Colo.*—The Park Comn. is reported to have awarded to J. Geo. Leynor Co. the contract for a new pumping plant at City Park, for $16,693.

Greeley, Colo.—M. P. Henderson, City Clk., writes that an election will be held on Dec. 26 to vote on issuing $320,000 bonds for the construction of water works. Engineer, Geo. G. Anderson, of Denver.

Washington, D. C.—Bids will be received until Dec. 26 at the Bureau Supplies and Accounts, Navy Dept., Washington, to furnish at the Navy Yard, Pensacola, Fla., and the Naval Stations, Key West, Fla., and New Orleans, La., a quantity of naval supplies as follows: Schedule 266, Iron bolts, storage tank, yellow pine, c. i. pipe and specials, galvanized iron pipe, pipe fittings, gate valves, hose connections. Schedule 267, Yellow and white pine, ash. Applications for proposals should designate the schedules desired by number. H. T. B. Harris, Paymaster-Gen., U. S. N.

Kirkwood, Ill.—It is stated that bids will be received until Dec. 15 by C. E. McLinn, Village Clk., for drilling a deep well.

Chicago, Ill.—Bids will be received until Dec. 22 by the Dept. Pub. Wks. (J. M. Patterson, Comr.) for furnishing and erecting in the boiler room of the Harrison St. pumping station 2 horizontal water tube boilers, with all necessary appurtenances.

Delphi, Ind.—Bids are wanted for furnishing 100 water meters. John W. F. Fawcett, City Clk.

Ft. Wayne, Ind.—Bids will be received by F. W. Urbahns, Secy. Water Works Trus. until Dec. 21, for furnishing material and improving water works, to include 10,000,000-gal. high-duty pumping engine, 6,000,000-gal. auxiliary pumping plant, pumps, boilers, concrete reservoirs, valves, etc., as advertised in The Engineering Record.

**Davis, Ind. Ter.*—The following are the bids opened on Nov. 29 for constructing complete a system of water works (W. P. Bullock, Consulting and Superv. Engr., Longview, Tex.); W. W. Cook & Sons, Junction City, Kan., $23,200 (awarded contract); N. S. Sherman, Oklahoma City, Okla., $22,977; McQuatters Plumbing & Machine Co., Hillsboro, Tex., $23,950; G. Jeager, Rich Hill, Mo., $23,150, and American Water & Light Co., Kansas City, Mo., $24,000.

Waterloo, Ia.—M. B. Locke, of Waterloo, it is reported, has filed with the City Clk. a proposition offering to construct water works should the Council decide to construct a plant independent of the present system.

Albia, Ia.—T. J. Baird, City Clk., writes that the question of constructing water works, to cost about $40,000, is under consideration, but no election has as yet been authorized.

Lincoln Center, Kan.—See "Power Plants, Gas and Electricity."

Winfield, Kan.—By the dissolving of an injunction in the federal court, this city is reported to be now free to issue $89,000 bonds for the construction of municipal water works.

Winthrop, Mass.—At a special town meeting held Nov. 23 the citizens are stated to have voted in favor of the town purchasing the plant of the Revere Water Co. in Winthrop.

**Springfield, Mass.*—The D'Olier Eng. Co., of New York, N. Y., is reported to have secured the contract for the pump and engine to be used in delivering water from Ludlow reservoir to the new filtration plant, for $3,255.

Brainerd, Minn.—Stone & Webster, 84 State St., Boston, Mass., are the engineers who will have charge of the proposed water works improvements at Brainerd.

Sleepy Eye, Minn.—Engr. J. F. Johnson, of Gibbon, writes that bids are wanted until Dec. 15 for constructing water works, to cost about $4,000.

Macon Miss.—An appropriation of $10,000 has been made for building a filter, steel tower and tank. W. F. Wilcox, Engr., Jackson.

Grenada, Miss.—See "Power Plants, Gas and Electricity."

Huntley, Mont.—Specifications are on file at the office of The Engineering Record, 114 Liberty St., New York, N. Y., and bids will be received at the office of the Engineer, U. S. Reclamation Service, Billings, until Jan. 15, for the construction of Division 1 of main canal, Huntley project, including 3 tunnels, involving the excav. of about 75,000 cu. yds. earth, some rock excav., concrete, etc., as advertised in The Engineering Record.

Lincoln, Neb.—Bids will be received by Thos. H. Pratt, City Clk., until Jan. 15 for furnishing a high-duty pumping engine complete, including water and steam connections, as advertised in The Engineering Record.

Bordentown, N. J.—H. W. Kunzi, City Clk., writes that no new contracts are to be let in connection with the issue of $15,000 recently voted for the completion of water works. Work is now under construction by Hugh J. Reilly, Jr., contractor.

Avalon, N. J.—Bids will be received until Dec. 21 by the Street Com. of Boro. Council (Geo. W. Kates, Chmn.) for furnishing and laying about 7,000 lin. ft. of 4-in. c.-i. water pipe.

Socorro, N. M.—See "Power Plants, Gas and Electricity."

Deming, N. M.—The Deming City Water Co. is reported incorporated with a capital of $100,000, by Paschal R. Smith, W. C. Wallis, Jas. R. Waddill and others, all of Deming. The company will pump the underflow of the Mimbres River for domestic and irrigation purposes.

New York, N. Y.—The following are the totals of bids opened on Nov. 29 by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying water mains in Green, Newell, Amsterdam and other avenues and streets in Manhattan and Bronx Boros.: Louis D. Gregory, 125th St. and 1st Ave., $20,058; M. D'Ambra & Co., 205th St and Villa Ave., $25,779; M. O'Brien, 1909 Amsterdam Ave., $21,079; Milton Constr. Co., 115 Elliott Ave., $20,742; Clinton Beckwith, 49 W. 27th St., $23,304, and John Cornwell, Jr., 69 E. 127th St., $21,400.

The bids opened on Nov. 22 by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying high pressure fire service mains and appurtenances in the Southern, Northern and Middle Districts, have been rejected, and new bids will be called for. But two bids were received for this work, Lynch Constr. Co., $3,700,443, and Frank Bradley, $3,571,365.

**Buffalo, N. Y.*—The Bd. of Councilmen is stated to have voted on Nov. 29 to award the contract for the 25,000,000-gal. pump to the Allis-Chalmers Co., of Milwaukee, Wis., at $26,600.

The following are the bids opened on Dec. 1 by Col. Francis G. Ward, Com. of Pub. Wks., for a 30-ton electric traveling crane for the pumping station: Northern Eng. Wks., Detroit, Mich., $9,300; Manning, Maxwell & Moore, New York, $10,676; Whiting Fdry. Equipment Co., Harvey, Ill., $10,200.

Seneca Falls, N. Y.—We are informed that nothing will be done before 1906 toward constructing water works.

Albany, N. Y.—The Bureau of Water is reported to be preparing plans and specifications for pumping engines.

Troy, N. Y.—Bids will be received until Dec. 19 by the Bd. of Contract & Supply, for building a municipal water filtration plant, with auxiliary pumping plant, and 2 stand pipes, also laying water mains to connect the present works with the filter plant, pumping plant and stand pipes, the duplication of stream crossings on the Tomhannock pipe line and all necessary appurtenances, as advertised in The Engineering Record.

New York, N. Y.—The following are the bids opened Nov. 29 by John T. Oakley, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying water mains in Anderson, Briggs, and other streets and avenues in Manhattan and Bronx Boro.: (*a*) Louis D. Gregory, 125th St. and 1st Ave.; (*b*) Clinton Beckwith, 49 W. 27th St.; (*c*) The Wilton Constr. Co., 115 Elliott Ave., Williamsbridge; (*d*) John Cornwell, 69 E. 129th St.; (*e*) M. D'Ambra Co., 205th St. and Villa Ave. M. O'Brien also submitted a bid, which is reported to have been informal:

	a	*b*	*c*	*d*	*e*
1,170 tons straight pipe	$33.00	$33.00	$31.25	$30.00	$31.00
55 tons special castings	62.00	65.00	61.50	70.00	65.00
207 tons gate valve boxes and covers	50.00	60.00	52.20	....	55.00
15 cu. yds. rock excav., without blasting	6.00	7.50	.267	10.00	6.00
2,250 cu. yds. rock excav	2.50	3.00	.267	2.50	3.00
100 cu. yds. masonry excav., without blasting	.01	3.00	.267	1.00	.30
26,000 cu. yds. earth excav	.24	.27	.267	.30	.30
26,550 cu. yds. fill and embankment	.24	.25	.267	.15	.05
550 lin. ft. 20-in. pipe	.50	.50	.93	.90	.75
4,900 lin. ft. 12-in. pipe, to lay	.30	.35	.35	.60	.30
46,800 lin. ft. 6-in. pipe	.12	.20	.16	.20	.15
1 36 x 6-in. connection, without shutting off water	150.00	200.00	150.00	150.00	250.00
1 20 x 12-in. connection, without shutting off water	120.00	150.00	150.00	150.00	200.00
1 20 x 6-in. connection, without shutting off water	100.00	125.00	100.00	100.00	175.00
10 cu. yds. brick masonry	.01	12.50	.01	....	.01
20 cu. yds. concrete masonry	6.00	6.00	6.00	....	.01
375 sq. yds. asphalt pav't & asphalt or artificial stone sidew'k.	4.00	3.00	4.00	....	4.00
100 sq. yds. granite block pav't on concrete found., tar or gravel or cement joints	.01	.01	2.00	....	.01
1,000 sq. yds. macadam pav't	.01	.01	.40	....	.01
1,200 sq. yds. pav't and flag	.01	.01	.01	....	.05
2,000 lin. ft. curb and gutter, to reset	.01	.01	.01	....	.01
120 lin. ft. boxing for 6-in. pipe	7.00	5.00	3.50	5.00	5.00
Totals	$94,058	$101,183	$92,488	$93,532	$100,621

Cleveland, O.—Bids will be received by A. R. Callow, Secy. Bd. Pub. Service, until Dec. 20 for the construction, delivery and erection of a water tower of 200,000 U. S. gals. capacity, for the water works division of the Dept. of Pub. Service, as advertised in The Engineering Record.

**Struthers, O.*—The Mahoning Valley Water Co. is reported to have awarded to Wm. McIntyre Sons, of Sharon, Pa., the contract for building a dam on Yellow Creek, about one mile east of Struthers; the dam will be of stone, 300 ft. wide and 68 ft. high, and cost about $100,000.

Woodward, Okla.—Bids will be received until Dec. 26 at the office of F. H. Raser, Town Treas., for $50,000 bonds for constructing a water works system.

Oklahoma City, Okla.—The citizens are reported to have voted to issue $450,000 bonds for improvements to the water works and sewerage system.

Watongo, Okla.—See "Power Plants, Gas and Electricity."

Tecumseh, Okla.—The City Council has contracted with Burns & McDonnell, Dwight Bldg., Kansas City, Mo., to make preliminary surveys and estimates for water works; if work can be done at an expense that will justify the construction of the work at present, a vote on the issue of $50,000 bonds may be taken. R. J. Wox, City Clk.

Eugene, Ore.—The City Council is reported to be preparing to improve the water works.

Ephrata, Pa.—Bids will be received until Dec. 15 by T. C. Reddig, Boro. Clk., for $45,000 water bonds.

Philadelphia, Pa.—The Dept. of Pub. Wks., in its budget for 1906, it is stated, has asked City Council to appropriate $5,054,460 for the completion of the filtration system, the items include the completion of the distribution system and pumping machinery to lift water from the Delaware River into the Torresdale plant, $4,200,000 to increase capacity of Belmont pumping station, $370,000; to increase capacity of Roxborough pumping plant, $313,000; increase capacity of Roxborough high service station, $51,000; to increase capacity of Belmont high service pumping station, $26,000, and resanding filters, $17,000.

Lawrenceburg, Tenn.—See "Power Plants, Gas and Electricity."

Clifton, Tex.—The citizens are reported to have voted to issue bonds for water works, and as soon as sold a $10,000 water system will be installed.

Shenandoah, Va.—See "Power Plants, Gas and Electricity."

Tacoma, Wash.—Leo. H. Long, of Tacoma, it is stated, has petitioned the Co. Comrs. for a franchise to construct a water works system to supply the residents of the Indian addition.

Sumner, Wash.—The citizens are reported to have voted Nov. 25 to issue $13,800 bonds to purchase the water works and improve same.

Milwaukee, Wis.—Bids will be received until Dec. 20 by the Bd. Pub. Wks. (Chas. J. Poetsch, Chmn.) for furnishing material and constructing for the water department, a brick tunnel under and across the Milwaukee River, from Knapp to Poplar Sts.

Encampment, Wyo.—J. A. Whiting, of Encampment, Engr. of the North Platte & Encampment Canal Co., writes that bids will probably be received on Jan. 1 for the construction of an irrigation system to cost about $169,000.

Lander, Wyo.—N. H. Brown, Acting City Engr., writes that the citizens have voted to issue $52,500 bonds for the construction of a gravity system of water works.

Guelph, Ont.—The Water Wks. Com., it is stated, will recommend to the City Council the appointment of Allen Hazen of New York, N. Y., to investigate the local filter question.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Van Buren, Ark.—J. E. Clark, of Nevada, Mo., is reported to have been asked by the Van Buren Club to prepare an estimate of probable cost of a sewerage system for Van Buren.

Plainville, Conn.—Engineer Max J. Unkleback, of New Britain is making a survey of the town, with a view to installing a system of sewerage, to empty into filtration beds in the southwest section of town.

Waterbury, Conn.—Bids will be received until Dec. 30 by the Bd. Pub. Wks. for constructing a continuation of Sect. One, Main Carrier, a reinforced concrete sewer, 4 ft. 5 in. x 4 ft. 6 in. in all about 4,060 ft., and including 2 tunnels, a river crossing and 3 trunk sewer connections, the tunnels to be constructed during the winter months; also for constructing Sect. two, Main Carrier, a sewer of similar type and dimensions, in all about 1,860 ft. Robt. A. Cairns, City Engr.

Georgetown, D. C.—The Supt. of Sewers of Washington, it is stated, has included $70,000 in his annual estimates for the extension of the California Ave. sewer, between Rock Creek and Wisconsin Ave., for the benefit of the residents of Tenleytown.

Ft. Oglethorpe, Ga.—Bids will be received until Dec. 18 by Capt. C. Nixon, Q. M., U. S. A., for constructing an addition to the bacterial purification plant for sewage at Ft. Oglethorpe.

**Chicago, Ill.*—The Stroebel Steel Constr. Co., Monadnock Bldg., has secured the contract for the c. i. and steel plate engine pit at the Lawrence Ave. sewage pumping station (bids opened Dec. 5) for $8,710.

Rock Island, Ill.—The City Council is reported to have ordered plans prepared for a storm drain and sewerage system in the southwest end of city.

South Bend, Ind.—Bids will be received by the Bd. of Public Works. until Dec. 20 for the construction of a trunk sewer on Kenwood Ave., of vitrified brick or reinforced concrete, 60-in. diam. circular, and about 2,434 ft., as advertised in The Engineering Record.

Plans are under way and will be completed in about 30 days for the trunk sewer for the business district to be constructed during the coming year. A. J. Hammond, City Engr.

Jeffersonville, Ind.—Victor W. Lyon, City Engr., is preparing plans for 4,332 ft. of tile sewers, with 29 catch-basins and 9 manholes, etc.

Atlantic, Ia.—The City Council is reported to be considering the question of completing the sewerage system, at a cost of $27,000.

**Salem, Mass.*—The Sewerage Comn., it is stated, has awarded to Pitman & Brown, of Salem, the contract for the pumping plant, and Carl B. Patten, of Salem, the contract for the equipment of the pumps and dynamos, the total cost to be about $35,000 (bids opened Nov. 27).

Delray, Mich.—The following are reported to be the bids opened on Nov. 27 by the Council for constructing a sewer from St. Louis Ave. to the city limits. E. P. Adams & Co., $21,840; Julius Porath, $23,300; J. A. Mercier, $23,800; Langley & Jaynes, $24,000; J. Jaynes, $24,124 and Sheehan & Co., $24,860.

---

* *Items marked thus give the names of parties awarded contracts.*

Morris, Minn.—This city is considering the construction of a sewerage system. At the present time it has no sewerage system of any kind, and the matter has been referred to Lewis C. Spooner, who would like information on the subject. There is reported to be a good opening here also for an engineer or surveyor.

Grenada, Miss.—See "Power Plants, Gas and Electricity."

St. Louis, Mo.—The lowest bid opened on Nov. 24 by the Bd. of Pub. Improv. for constructing a sewer in Tamm Ave. sewer district, is stated to have been submitted by McIntyre & Teese, 3946 Evans Ave., for $15,716.

Ft. Assiniboine, Mont. See "Public Buildings."

McCook, Neb.—W. A. Middletown, City Clk., writes that C. H. Meeker is engineer for the proposed sewerage system. It is proposed to hold an election to vote on issuing bonds for same.

Jersey City, N. J.—Bids will be received until Dec. 11 by the Bd. Street and Water Comrs. (Geo. T. Bouton, Clk.) for reconstructing sewers in Mercer and Colgate Sts. Approximate estimates of quantities: 775 lin. ft. 18-in. vitr. pipe sewer; 129,000 lin. ft. piles driven; 129,000 ft. B. M. capping, 10 x 10; 9,300 ft. B. M. flooring 4-in.; 25,000 ft. B. M. sheathing.

**Brooklyn, N. Y.*—The Donlon Constr. Co. has secured the contract for reconstructing sewer in Himrod St. from Evergreen to Knickerbocker Ave. (bids opened Nov. 15) for $5,874. The other bidders were J. L. Carey, $6,542; P. J. McCauley, $7,660; O'Grady Bros., $8,153, and T. O. C. Sloane, $8,161.

*J. L. Carey has secured the contract for constructing a sewer in Ocean Parkway from Beverly Road to Ave. C, for $7,904, and Philip Hayes has secured the contract for a sewer in Junius St. for $3,923 (bids opened Nov. 22).

Ravenna, O.—It is reported that bids will be received until Dec. 30 by S. H. Freeman, City Clk., for $22,500 sewer bonds.

Oklahoma City, Okla.—See "Water."

Pittsburg, Pa.—It is stated that bids will be received until Dec. 13 by the Dept. Pub. Wks. (Edw. M. Bigelow, Dir.), for constructing sewers.

Narbeth, Pa.—Plans are reported as being considered for the construction of a sewerage system, to be about 7 miles in length.

Kincardine, Ont.—It is stated that bids will be received by J. H. Scougall, Town Clk., until Dec. 18, for constructing a sewerage system.

Hamilton, Ont.—The Council on Nov. 27 passed an ordinance authorizing the issue of $20,000 bonds for additional sewers to prevent flooding.

The Provincial Health Dept. is stated to have approved the plans for the east end drainage, as submitted by City Engr. E. G. Barrow.

Montreal, Que.—The Finance Com. of Council has voted to give to the Road Committee $12,210 to constuct a sewer in Royer St.

BRIDGES.

Notes Arranged Alphabetically by States.

Phoenix, Ariz.—See "Miscellaneous."

San Mateo, Cal.—R. H. Jury, City Clk., writes that the citizens voted on Nov. 25 in favor of constructing a bridge, but defeated the proposition to buy land on which to build it. Matter is held in abeyance.

**Decorah, Ia.*—N. M. Stark & Co., of Des Moines, are reported to have secured the contract for constructing a bridge over Iowa River, the new structure to be concrete, 162 ft. long and 26 ft. wide. It will have 2 concrete spans 81 ft. in length and cost about $15,000.

Wilson, N. C.—Bids will be received until Dec. 18 by the Bd. Co. Comrs., for constructing the superstructure of a steel bridge across the Moccasin River near Wilson, to have 2 spans, each span to be 80 ft. and to have a 16-ft. roadway. John W. Haus, Engr., 3 S. Adams St., Petersburg, Va.

Cambridge, O.—Bids will be received until Dec. 19 by the Co. Comrs. for constructing 2 abutments with wing wall for bridge across Chapman Creek, in Cambridge Township, near the Cambridge and Byesville Driving Park. Separate bids to be submitted on concrete and stone; also on same date for constructing an iron and steel bridge 60 ft. long and 16 ft. roadway about 1½ miles north of Byesville, over Chapman Creek. Bids for this bridge are to include plans and specifications. Danl. R. Wallace, Co. Aud.

Carlisle, Pa.—It is stated that bids will be received until Dec. 22 by the Bd. Co. Comrs., for constructing a bridge over a creek. W. A. Lepperd, Clk.

**Easton, Pa.*—The Easton Foundry & Machine Co. of Easton is reported to have secured the contract for widening and repairing the bridge over Bushkill Creek at Front St. for $7,999.

Bradford, Pa.—Bids, including plans, will be received until Dec. 18 for the construction of a foot bridge 75 ft. c. to c., 8 ft. wide. A. F. Bannon, Jr., City Engr.

Canton, S. D.—It is stated that bids, including plans and specifications, will be received until Dec. 14, by the Bd. Co. Comrs., for constructing steel bridges for ensuing year. Chas. Kundert, Co. Aud.

Chattanooga, Tenn.—Bids will be received by the Bd. of Pub. Wks., until Jan. 9, for the erection of the superstructure of a steel highway bridge, single span, 176 ft. in length, on 11th St., as advertised in The Engineering Record.

**Brooklyn, N. Y.*—Bids were opened on Nov. 15 by Martin W. Littleton, Pres. Brooklyn Boro., for furnishing material and constructing a sewer in Quay St., from East River to West St., etc. Bids were submitted on three different estimates, as follows: Estimate A, for reinforced concrete; Estimate B, one-half reinforced concrete and one-half brick; Estimate C, brick; (1) Newman Constr. Co.; (2) Wm. P. McGarry; (3) Jas. Malloy & Co.; (4) Jas. H. Holmes; (5) M. J. Creem; (6) Donlon Constr. Co. (bidders all of Brooklyn.) Jas. Malloy & Co. secured the contract on Estimate C.

		1315 lin. ft. 66-in. reinforced con. sewer.	685 lin. ft. 60-in. reinforced con. sewer.	665 lin. ft. 54-in. reinforced con. sewer.	866 lin. ft. 48-in. sewer.	715 lin. ft. 36-in. sewer.	325 lin. ft. 30-in. sewer.	540 lin. ft. 24-in. sewer pipe.	660 lin. ft. 18-in. sewer pipe.	405 lin. ft. 15-in. sewer pipe.	30 lin. ft. 12-in. sewer pipe.	47 manholes.	1 sewer basin.	312 M. ft. found. & pile cap.	220 M. ft. sheeting, etc.	47,000 lin. ft. piles.	1 sewer basin, reconnected.	179 cu. yds. concrete cradle.	3,950 lin. ft. 12-in. pipe sub-drain.	Totals.
(1)	A...	$27.60	$23.35	$18.65	$14.25	$11.10	$12.30	$3.25	$2.50	$2.25	$2.00	$55.00	$150.00	$0.01	$0.01	$0.25	$50.00	$0.01	$0.01	$107,924
	B...	27.60	23.35	18.65	15.75	12.60	13.80	3.25	2.50	2.25	2.00	55.00	150.00	.01	.01	.25	50.00	.01	.01	110,783
	C ...	27.60	23.35	18.65	15.25	12.10	13.30	3.25	2.50	2.25	2.00	55.00	150.00	.01	.01	.25	50.00	.01	.01	109,830
(2)	A...	25.23	20.44	17.89	14.19	9.79	7.77	4.44	4.00	3.27	2.67	50.00	150.00	32.00	32.00	.25	75.00	7.25	.60	122,348
	B...	25.23	20.44	17.89	11.26	9.50	7.50	4.44	4.00	3.27	2.67	50.00	150.00	32.00	32.00	.25	75.00	7.25	.60	119,516
	C...	25.23	20.44	17.89	13.00	12.00	9.00	4.44	4.00	3.27	2.67	50.00	150.00	32.00	32.00	.25	75.00	7.25	.60	123,497
*(3)	A...	18.00	15.00	11.00	10.00	8.00	7.00	4.50	4.00	3.50	2.00	50.00	150.00	30.00	.01	.30	50.00	5.00	.75	94,332
	B...	18.00	15.00	11.00	11.00	9.00	8.00	4.50	4.00	3.50	2.00	50.00	150.00	30.00	.01	.30	50.00	5.00	.75	96,238
	*C...	18.00	15.00	11.00	9.00	7.00	6.00	4.50	4.00	3.50	2.00	50.00	150.00	30.00	.01	.30	50.00	5.00	.75	*92,426
(4)	A...	23.00	16.00	15.00	10.50	9.00	7.00	4.00	3.50	3.00	2.50	75.00	150.00	25.00	17.00	.21	100.00	.01	.01	99,969
	B...	23.00	16.00	15.00	9.00	8.00	6.00	4.00	3.50	3.00	2.50	75.00	150.00	25.00	17.00	.21	100.00	.01	.01	97,630
	C...	23.00	16.00	15.00	12.50	10.00	8.00	4.00	3.50	3.00	2.50	75.00	150.00	25.00	17.00	.21	100.00	.01	.01	102,741
(5)	A...	28.00	22.00	20.00	15.00	10.00	10.00	5.00	4.00	3.00	2.50	45.00	150.00	35.00	.01	.25	50.00	.01	1.00	124,149
	B...	28.00	22.00	20.00	15.00	10.00	10.00	5.00	4.00	3.00	2.50	45.00	150.00	35.00	.01	.25	50.00	.01	1.00	124,149
	C...	28.00	22.00	20.00	13.00	8.50	8.50	5.00	4.00	3.00	2.50	45.00	150.00	35.00	.01	.25	50.00	.01	1.00	120,857
(6)	A...	25.00	25.00	23.00	20.00	15.00	10.00	3.00	3.00	2.00	2.00	40.00	100.00	25.00	20.00	.20	10.00	.01	.01	124,691
	B...	25.00	25.00	23.00	20.00	15.00	10.00	3.00	3.00	2.00	2.00	40.00	100.00	25.00	20.00	.20	10.00	.01	.01	124,691
	C...	25.00	25.00	23.00	18.00	12.00	8.00	3.00	3.00	2.00	2.00	40.00	100.00	25.00	20.00	.20	10.00	.01	.01	120,164

Buffalo, N. Y.—Bids will be received until Dec. 15 by the Bd. Pub. Wks. (Francis G. Ward, Comr.) for constructing a 20, 18 and 15-in. tile sewer in a portion of Perry St.; separate bids will be received for constructing a 10-in. tile sewer in a portion of S. Park Ave.

Newark, N. Y.—R. A. S. Bloomer, of the Municipal Board, writes in regard to the construction of a sewerage system, that plans are being prepared, and when completed will be sent to Albany for approval, after which the question will be submitted to a vote of the taxpayers.

Ft. Lincoln, N. D.—The following are reported to be the bids opened on Nov. 27 by Col. W. W. Robinson, Jr., Q. M., U. S. A., St. Paul, Minn., for laying an 8-in. water main connecting the present water main at Ft. Lincoln with the water supply system of Bismarck, a distance of about 3 miles (price given per lin. ft.): W. D. Lovell, Minneapolis, Minn., 89 cts.; Des Moines Bridge & Iron Co., Des Moines, Ia., $1.18; Allen-Black Co., St. Paul, Minn., $2.35; Dwyer Plumbing & Htg. Co., St. Paul, Minn., $1.56½; Healy Plumbing & Htg. Co., St. Paul, Minn., $1.77; W. I. Gray & Co., Minneapolis, Minn., $1.73, and Jas. Kennedy, Fargo, N. D., $1.59.

Cleveland, O.—Bids will be received until Dec. 14 by the Bd. Pub. Service (A. R. Callow, Secy.) for constructing sewers in portions of several streets.

Columbus, O.—Bids will be received until Dec. 13 by the Bd. Pub. Service (Chas. H. Frank, Secy.) for constructing sanitary sewers in numerous streets.

Cincinnati, O.—Bids will be received untl Dec. 27 by the Bd. Pub. Service (Geo. F. Holmes, Clk.) for constructing sewers in portions of McMillan and Waldon Sts.

Boston, Mass.—Bids will be received until Dec. 15 by the Cambridge Bridge Comn. (Danl. A. Whelton, Chmn.), at the Mayor's office, Boston, for furnishing material and constructing Cambridge wing walls and abutments for the Cambridge Bridge.

Gloucester, Mass.—Bids will be received until Jan. 4 by the Bd. Co. Comrs., Salem (Jas. P. Hale, Asst. Clk.) for constructing the substructure and superstructure of a rolling lift bridge over the new canal on Western Ave., Gloucester. Probable cost, $55,000.

Salem, Mass.—Bids will be received until Jan. 4 by the Bd. Co. Comrs. (Jas. P. Hale, Asst. Clk.) for constructing a bridge across Danvers River, berween Beverly and Salem. Estimated cost, $100,000.

**Minneapolis, Minn.*—Bayne & Hewett, of Minneapolis, are stated to have secured the contract for the steel work necessary for widening Washington Ave. Bridge (bids opened Nov. 24) for $47,987.

Zim, Minn.—It is stated that bids will be received until Jan. 2 by O. Holden, Co. Aud., Duluth, for constructing a steel bridge across St. Louis River near Zim.

Edina, Mo.—Bids will be received by Thos. Conway, County Road and Bridge Comr., until Dec. 14, for building 12 steel bridges, as advertised in The Engineering Record.

Kansas City, Mo.—See "Miscellaneous."

Helena, Mont.—See "Paving and Roadmaking."

Madison, Neb.—It is stated that bids will be received by Emil Winter, Co. Clk., until Dec. 12, for constructing and repairing bridges and approaches thereto, during the year 1906.

**Elyria, O.*—The following are the bids opened on Nov. 23 by the Bd. of Public Service (Scott Hinman, Clk.) for constructing a trunk sewer and branches on the east side: (*a*) Ferguson & Purcell, Lorain; (*b*) Paul & Kershner, Dayton; (*c*) F. J. Backus, Dayton; (*d*) Price & Hurley, Marion (awarded contract); (*e*) Hennessey & Co., Napoleon:

	a	*b*	*c*	**d*	*e*
2,012 ft. 36-in. brick sewer	$3.25	$3.00	$2.70	$3.00	$3.50
3,690 ft. 24-in. pipe sewer	1.25	1.50	1.40	1.50	1.05
900 ft. 20-in. pipe sewer	.90	1.30	1.00	1.30	.75
1,880 ft. 18-in. pipe sewer	.70	1.00	.77	1.00	.59
900 ft. 8-in. pipe sewer	.20	.50	.20	.50	.16½
8,113 cu. yds. earth excavation	.50	.50	.50	.50	.40
6,986 cu. yds. rock excavation	3.50	2.50	2.85	2.25	2.90
Concrete per cu. yd.	7.00	..	12.00	..	..
23 manholes	55.00	50.00	54.00	50.00	35.00
Lumber per M ft.	30.00	30.00	..	..	40.00
Totals	$44,774	$38,964	$39,443	$37,218	$38,043

Knoxville, Tenn.—It is stated that plans, specifications and bids will be received until Dec. 20 by the Com. (B. S. Williams, Chmn., 208½ Vine Ave.) for constructing bridge; bids will be received for a stone or concrete arch, steel or wooden bridge.

**Cameron, Tex.*—E. P. Alsberry & Son, of Houston, are reported to have secured the contract for constructing a suspension bridge at Faubrous Crossing over Little River, for $7,400, the structure to be 400 ft. long, consisting of 2 spans.

**Tacoma, Wash.*—H. Winchester, Chmn. Co. Comrs., writes that the contract for piling and trestling a portion of Lincoln Ave. and constructing a drawbridge across Hylebos Creek, near Tacoma (bids opened Nov. 24) has been awarded to Northwestern Bridge Co., of Tacoma, for $6,000.

Manitowoc, Wis.—It is stated that bids will be received until Dec. 18 by John S. Unger, City Clk., for constructing a steel bridge over the Manitowoc River at 10th St., to be 378 ft. between abutments, with an 80-ft. draw, and to have a 21-ft. roadway, with 7-ft. sidewalk.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

**Mobile, Ala.*—The Asphalt Paving Co., of Georgia, with offices at Atlanta, Ga., has secured the contract for paving with asphalt, 3,500 sq. yds. (bids opened Nov. 23).

Montgomery, Ala.—Bids will be received until Dec. 18 by R. S. Williams, City Treas., for paving portions of numerous streets with Schillinger and hexagon block.

Little Rock, Ark.—It is reported that bids are wanted Dec. 28 for paving 22 blocks with asphalt, bitulithic or vitrified brick on a 5-in. concrete base. E. A. Kingsley, City Engr.

The Mayor is stated to have approved the ordinance providing for an appropriation of $6,000 toward the paving of Center St.

East St. Louis, Ill.—W. J. Crocken, City Engr., is preparing plans for the improvement of Piggott Ave. from 4th to 14th St.

**Terre Haute, Ind.*—W. C. Dorsey is stated to have secured the contract for improving 15 miles of highway in Pierson Township with gravel for $35,500.

* *Items marked thus give the names of parties awarded contracts.*

South Bend, Ind.—It is proposed to pave Cushing St. from Jefferson to Main St. with asphalt.

Indianapolis, Ind.—The Bd. of Wks. is stated to have decided to pave with asphalt a portion of Michigan St.

*_Salina, Kan._—Arthur Jung is reported to have secured the contract for paving with brick a portion of 10th St. at $1.69 per sq. yd.

Manistee, Mich.—The Common Council has ordered specifications prepared for paving River St. with either brick, bituminous macadam or bitulithic pavement, about 5,400 sq. yds.

Lansing, Mich.—The Council has ordered plans prepared for paving Michigan Ave. east, with brick on a sand foundation, a distance of 1 mile. H. A. Collar, City Engr.

Red Jacket, Mich.—N. Kaiser, Village Clk., writes that the citizens voted Nov. 27 to issue $125,000 bonds for street paving and cement walks.

Grenada, Miss.—See "Power Plants, Gas and Electricity."

*_Kansas City, Mo._—The contract for macadamizing a portion of Admiral Boule. is reported to have been awarded by the Bd. of Park Comrs. to J. A. Stewart at $1.34½ per sq. yd.

Helena, Mont.—Bids will be received until Jan. 2 by the Bd. Co. Comrs., for all work, including bridges, culverts, grading and swamping necessary to the construction of a good wagon road on the proposed change in the Lewis and Clark Pass County road. Percy R. Witmer, Co. Clk.

*_Newark, N. J._—The following are the bids opened on Nov. 23 by the Street and Water Comrs. for paving (_a_) S. 14th St., with 13,550 sq. yds. brick pavement on 6-in. concrete; (_b_) Johnson St., 5,650 sq. yds. granite block pavement on sand: Wm. Van Keuren & Son, _a_ $33,717; J. R. Shanley, _a_ $33,023, _b_ $1.98 per sq. yd., total $12,608 (awarded contract); Harrison Constr. Co., _a_ $31,641, _b_ $14,030; Newark Paving Co., 800 Broad St., _a_ $1.91 per sq. yd., total $29,229 (awarded contract), _b_ $14,172; Jersey Paving Corporation, _a_ $30,071.

Avalon, N. J.—Bids will be received until Dec. 21 by the Boro. Council (Geo. W. Kales, Chmn. Com.), for street grading and concrete curbing under contracts Nos. 10, 11 and 12 (about 13,000 ft. curbing).

Albany, N. Y.—The Bd. of Supervisors are stated to have received plans from the State Engineer for improving the Selkirk and Coeymans Road at an estimated cost of $41,000.

*_Schenectady, N. Y._—The Schenectady Contr. Co. is stated to have secured the contract for paving with sheet asphalt Waldorf Pl. and Rugby Rd., at $1.43 per sq. yd.

Cobleskill, N. Y.—Wm. H. Golding, City Clk., writes that the citizens on Dec. 4 voted to issue $55,000 bonds for paving.

Buffalo, N. Y.—Separate bids will be received until Dec. 21 by the Dept. Pub. Wks. (Francis G. Ward, Comr.), for paving portions of Whitney Pl., Manner and Park Sts.

*_Ashville, N. C._—Warren Bros. Co., of Boston, Mass., have secured the contract for laying 5,000 sq. yds. of bitulithic on Grove and Phillips Sts.

Columbus, O.—The following are the totals of bids opened on Nov. 28 by the Bd. of Pub. Service (Julian Griggs, Ch. Engr.) for repaving and repairing Dennison Ave. from Spring St. to King Ave.; this work consists of 500 sq. yds. new Medina; 500 sq. yds. stone block relaid; 1,500 sq. yds. old Hayden block relaid; 7,000 sq. yds. brick paving: Frank J. Fisher, $13,860; Buckeye Eng. & Constr. Co., $12,935 and $13,285, according to the different kinds of brick; Harry J. Shaw, $12,770 and $12,700, and A. G. Pugh, $13,565, $13,635 and $13,705 (bidders all of Columbus).

Bids will be received until Dec. 13, by the Bd. Pub. Service (Chas. H. Frank, Secy.) for grading, curbing and paving portions of numerous streets with hard-burned brick or block, asphalt, macadam or other substantial material.

Lakewood (P. O., Cleveland), O.—It is stated that bids are wanted until Dec. 14 for paving with brick, Westwood and Olivewood Aves. Henry J. Sensel, Village Clk.

Cincinnati, O.—Bids will be received until Dec. 27 by the Bd. Pub. Service (Geo. F. Holmes, Clk.) for furnishing material and improving Josephine St., by grading, curbing and paving with bitulithic; also paving E. 3d St. with granite blocks.

*_Erie, Pa._—T. Hanlon, City Clk., writes that Mayer Bros., cor. 11th and Sassafras Sts., have secured the contract for resurfacing Parade St. with asphalt.

Philadelphia, Pa.—Bids will be received until Dec. 12 by the Dept. Pub. Wks. (A. Lincoln Acker, Dir.) Bureau of Water, for hauling water pipe, machinery and ashes, repairs to boilers and roofs, laying granolithic and asphalt pavement and repairs thereto.

Reading, Pa.—The Toledo Constr. Co., of Toledo, O., is stated to have received the contract for repairing asphalt streets throughout the city at $1.24 per sq. yd.

Pittsburg, Pa.—It is stated that bids will be received until Dec. 13 by the Dept. Pub. Wks. (Edwd. M. Bigelow, Dir.), for grading, curbing and paving with asphalt various streets.

Knoxville, Tenn.—The Council has passed on second reading the ordinance providing for the paving of Central St. with brick, from Depot St. to 4th Ave., about 16,000 sq. yds.

Petitions are also out for paving with brick, bitulithic or asphalt Locust, Cumberland, Clinch and Henley Sts., about 20,000 sq. yds.

Dallas, Tex.—The citizens have voted to issue $60,000 street improvement bonds. E. L. Dalton, City Engr. J. B. Winslett, City Secy.

*_Seattle, Wash._—T. Ryan, Sullivan Bldg., has secured the contract for concrete sidewalks on East Queen Anne Driveway at the following detail bid: 5,000 cu. yds. earthwork, 7 cts.; 234 M. ft. curb, etc., $15; 86 M. ft. crosswalks, $15; 18,550 sq. yds. concrete sidewalk, 95 cts.; 41 sq. yds. concrete alley crossings, $1.20; 2 catch basins (double inlets), $73; 7 catch basins (single inlets), $60; 6,000 lin. ft. 3-in. sewer pipe, 9 cts. and 200 lin. ft. concrete stairway, 40 cts.; total, $25,008. The other bids received were: McAdam & Cannon, $27,799; D. Dow & Co., $25,342; Sparger Concrete Co., $27,718; and Andrew Peterson, $25,469.

Toronto, Ont.—The City Engineer is stated to have estimated the cost of extending and macadamizing about 2,782 ft. of Queen St. through High Park, at $30,000.

POWER PLANTS, GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Ozark, Ark.—R. H. Adams is reported to have petitioned for a franchise to establish an electric plant.

Bakersfield, Cal.—Geo. L. Dillman, of San Francisco, formerly Ch. Engr. of the Western Pacific R. R., is reported to be in this city as a representaive of the Pierce estate, which owns land abutting the Kern River, and has made a preliminary survey, looking toward the construction of a power plant on Kern River.

Rio Vista, Cal.—Application has been made to the Bd. Town Trus. (E. M. Chase, Pres.) for a franchise to install, maintain and operate an electric light and power system for a term of 20 years from Jan. 1, 1906, for the purpose of selling and supplying electric light and power to said town and the inhabitants thereof; bids for said franchise will be received until Dec. 28 by F. J. Kalber, Town Clk.

Anaheim, Cal.—Bonds have not yet been voted for the proposed steam power plant for this city, to be constructed at a cost of $40,000. Engineer, Clem. A. Copeland, of Los Angeles.

Denver, Colo.—Capt. Henry I. Seemann, of Denver, writes that the Continental Mine, Power & Reduction Co. proposes constructing in the spring a power plant to cost from $50,000 to $75,000, and a tunnel at a probable cost of $200,000.

Washington, D. C.—Bids will be received until Dec. 19 at the Bureau Supplies and Accounts, Navy Dept., Washington, to furnish at the navy yards, etc., Portsmouth, N. H.; Boston, Mass.; Newport, R. I.; New York, N. Y.; League Island, Pa.; Annapolis, Md.; Washington, D. C., and Norfolk, Va., a quantity of naval supplies as follows: Schedule 260, Rubber covered wire, iron conduit and fittings, switches, electrical supplies, pipe and fittings, etc. Schedule 261, Lead covered wire, conduit fittings, electrical supplies, yellow pine, tool and gun steel, iron pipe, etc. Schedule 262, Torpedo deck trucks, surface plates, etc. Schedule 263, Motor generator set, steel wire rope, etc. Schedule 264, Vises, pig iron, boiler feed pump, feed water heater, etc. Applications for proposals should designate the schedules desired by number. H. T. B. Harris, Paymaster-Gen., U. S. N.

Augusta, Ga.—The City Council on Dec. 4 passed a resolution to investigate the advisability of the city constructing its own electric light plant, to be completed the time the present contract expires, which is Aug., 1907. Address, Nisbet Wingfield, City Engr.

Thomasville, Ga.—The citizens are reported to have voted to issue $30,000 bonds with which to purchase the plant of the Thomasville Electric Light Co.

Moscow, Idaho.—The Moscow Electric Light & Power Co. (A. W. Tyler, Ch. Electrician, Moscow) it is reported, is contemplating the extension of its power line from the main line at the Lewiston Water Power Co.'s plant to and through neighboring towns.

Jacksonville, Ill.—This city contemplates enlarging the municipal electric lighting plant, including the installation of generators and engines.

Noblesville, Ind.—The Noblesville Hydraulic Co. is reported to be preparing to ask for bids for the completion of a dam across White River, abandoned two years ago.

Hartley, Ia.—It is reported that Ira Steele is contemplating the installation of an electric light plant.

Elkader, Ia.—M. J. Poull, Pres. Elkader Gas Co., writes that it is proposed to construct a gasoline gas plant and 2 to 3 miles of mains. The company is now ready to receive estimates. Soil not hard for laying pipe.

Mt. Ayr, Ia.—The citizens are reported to have voted to grant a 20-yr. franchise to the Mt. Ayr Gas Co. F. F. Fuller, Pres.

Wichita, Kan.—Geo. W. Robinson, of Wichita, writes that he has a franchise for lighting the city with natural gas, and it will have to be piped from the east about 100 miles.

Osawatomie, Kan.—W. H. Murphy, Supt. and Engr. Osawatomie Light & Power Co., writes that it is proposed to construct an electric light plant at a cost of about $10,000. Will also add an ice plant later on.

Arcadia, La.—The plant of the Arcadia Electric Lighting Co. is reported to have been destroyed by fire on Nov. 22.

Portland, Me.—The Portland Lighting & Power Co. (J. R. Libby, Portland, Pres.) is reported as having plans prepared for a power plant to be built in this city or the suburbs. It is stated that the building is to be 2 stories high, 90 x 100 ft., and to be equipped with machinery sufficient to furnish 1,000 hp. It is reported that the General Electric Co. is to furnish the machinery.

Woburn, Mass.—An ordinance has passed first reading in the Bd. of Aldermen, authorizing the establishment of a municipal lighting plant.

Portland, Mich.—A. E. Dunn, of St. Louis, Mo., it is stated, is considering the establishing of a gas plant here for heating and domestic use.

Laurium, Mich.—Kerr & Petermann, it is reported, have applied to the villages of Laurium and Red Jacket for a franchise permitting them to use the streets and alleys of those villages for the installation of a gas system.

*_Minneapolis, Minn._—The Patterson Street Lighting Co., of Minneapolis and St. Paul, is stated to have secured the contract for maintaining 5,500 gas lamps for the street lighting of the city for 1906, at $12.25 per lamp with governors.

Little Falls, Minn.—It is reported that the Little Falls Water Power Co. contemplates making improvements to its plant.

Granite Falls, Minn.—The Council is reported to be considering enlarging the electric light plant.

Crookston, Minn.—The County Board, it is reported, is considering the installing of an independent electric plant for the purpose of lighting the county buildings.

Two Harbors, Minn.—See "Railroads."

Grenada, Miss.—The City Council is stated to have decided to issue $30,000 bonds, to be used for improving the streets and the water works, sewerage and electric light plant.

Hattiesburg, Miss.—The Hattiesburg Gas Co. is reported organized, and will apply for charter of incorporation. E. J. O'Beirne is reported interested.

Newark, N. J.—The City Hall Comn., it is stated, is considering the installation of a lighting plant in the new city hall, at a cost of about $41,000.

Washington, N. J.—The Washington Gas Co. is stated to have been organized with D. V. Wyckoff, pres.; Willard Alleger, vice-pres.; and J. S. Ackerman, secy. It is reported that the company has accepted the franchise granted by Common Council, and has several sites in view on which it is proposed constructing its plant next spring, and will decide upon the location at the January meeting of the company.

Passaic, N. J.—The question of constructing a municipal electric light plant, is reported under consideration here.

Socorro, N. M.—G. A. Collins, of Santa Fe, Ch. Engr., Socorro Water & Light Co., recently incorporated, writes that preliminary surveys have been made. The plan is to install a lighting plant, to be run by water power furnished by hot springs, 288 ft. above power site. Water after generating power by water wheel, will be used to supply the city of Socorro. Frank Owen of Santa Fe, Gen. Mgr.

Arcadia, N. Y.—The Town Trustees, it is stated, have granted a franchise to the Niagara, Lockport & Ontario Power Company to furnish electricity for light, heat and power purposes in this town. It is also stated that this company has applied to Newark and Lyons for franchises. E. D. Beal, of Rochester, and S. Nelson Sawyer, of Palmyra, are attorneys for the company.

Ticonderoga, N. Y.—The Ticonderoga Electric Light & Power Co. (C. Noel, Ch. Electrician, Ticonderoga) is stated to have applied to the State Electrical Comn. for permission to issue $50,000 bonds. It is reported to be the intention of the company to construct this fall a steam plant at Burleigh dock.

Central Islip, L. I., N. Y.—Bids will be received until Dec. 13 by the State Comn. in Lunacy (T. E. McGarr, Secy.), Albany, for rewiring Groups A, B and C, Central Islip State Hospital.

New York, N. Y.—The following are the bids opened on Dec. 4 by John F. Ahearn, Pres. Manhattan Boro. for the completion of the electric lighting system in the Criminal Courts Building, Franklin and Centre Sts: Lord Electric Co., Fuller Bldg., $35,885; Ries & O'Donovan, 1123 Bway., $25,400; Peter McAnerney & Powers, 225 4th Ave., $20,760; Commercial Constr. Co., 1 Madison Ave., $19,300, and W. M. Sheehan, 136 Liberty St., $28,848.

Watongo, Okla.—The citizens are reported to have voted in favor of issuing $6,000 bonds for an electric plant, and $10,000 bonds for extensions to be made to the water mains.

Scranton, Pa.—The West Scranton Light, Heat & Power Company is reported to be preparing to build a new power plant.

Pittsburg, Pa.—Both branches of the Councils, it is stated, have adopted a resolution authorizing the appointing of a committee of seven to inquire into the cost of installing a municipal electric lighting plant, the committee to report at the second meeting of the Councils in January.

Lebanon, Pa.—The Lebanon Gas Co. is reported to be considering the question of improving its plant.

Homestead, Pa.—The Council has authorized the Lighting Com. to procure estimates of cost of constructing and maintaining a municipal electric light plant.

Lawrenceburg, Tenn.—Kirkpatrick & Johnson, of Jackson, Miss., have been selected to prepare plans and supervise the construction of the municipal water works and electric light plant, to comprise a dam, turbines, dynamos (about 100 kw.), pole lines, arc lamps, motor and pump, water mains and steel tank. Jas. Dunn, City Secy.-Treas.

Barre, Vt.—It is reported that an explosion on Nov. 26 practically wrecked the plant of the People's Lighting, Heating & Power Co.

Shenandoah, Va.—Geo. Cadogan Morgan, 169 Jackson Boule., Chicago, Ill., will be engineer in charge of the construction of the combined water works and electric light plant at Shenandoah. Bids for material and machinery will be received by A. R. Martin, Town Clk., until Jan 2. In the issue of The Engineering Record on Dec. 2 we stated that G. C. Morgan had secured the contract to construct this plant and that Arthur M. Morgan was engineer. This was in error, as they both act entirely as engineers, under the name of Geo. Cadogan Morgan. They are to superintend the construction of this plant.

Salt Lake City, Utah.—Jas. J. Chambers, of Salt Lake City, Pres. and Mgr. of the Inter-Mountain Power Co., writes that it is proposed to construct during the spring three hydro-electric power stations about 17 miles from Salt Lake City; probable cost of work proposed $500,000. Engineer, Frank C. Kelsey, of Salt Lake City.

Provo, Utah.—Bonds amounting to $91,000 are reported sold to be used for water works and an electric light plant. Engineer, Frank C. Kelsey, Salt Lake City.

Vernal, Utah.—E. H. Wilson, of Vernal, is stated to have filed application at Salt Lake City for a water right on the Uintah reservation, the purpose being to establish a power plant.

Ritzville, Wash.—The Ritzville Electric Co., of Ritzville, is reported incorporated with a capital of $50,000. Incorporators: Philip Rowe, W. V. Reinhart, Jr., Geo. H. Tilden, and others.

*** Items marked thus give the names of parties awarded contracts.**

Odessa, Wash.—Jas. Shaw, of Harrington, is stated to have petitioned for a franchise for an electric light plant at Odessa.

Everett, Wash.—The City Council is reported to have granted to Clay Allen, of Seattle, representing the Snoqualmie Light & Power Co., a 3-yr. franchise; also contract for lighting the city for the same period, at $6.50 per light per month. The system will be installed at once and be completed by Mar. 1, 1906.

La Crosse, Wis.—The La Crosse Hydro-Electric Light & Power Co. is reported to have filed articles of incorporation at Madison. The company has a capital of $1,000,000, and has a State charter granting it rights to erect and maintain a water power plant near Black River Falls. It will expend about $750,000 within a year in the construction of a dam. The current will be transmitted to La Crosse, a distance of about 55 miles. Orlando Holway, E. G. Boynton and Roy E. Bingham, all of La Crosse, are the incorporators.

Hamilton, Ont.—Stewart & Witton, Archts. Hamilton, write that about $100,000 will be expended at the start by the Canadian District Heating Co. in the construction of an electric light and power plant. Bids will probably be called for in March.

Cobourg, Ont.—The Northumberland-Durham Power Co. is reported incorporated with a capital of $750,000, by W. J. Crossen, J. A. Culverwell, Chas. Donnelly and others, to develop the water power of Healy Falls.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

San Jose, Cal.—The San Jose & Santa Clara Ry. Co. (Hugh Center, of San Jose, Mgr.), and the Alum Rock Electric Rys, is reported to have filed a petition at San Jose, Cal., for a franchise to change the entire system into a standard-gage road. It is stated that $1,000,000 will be spent in rebuilding and equipping these roads. Arrangements are also being made to construct a connecting electric line between San Mateo and Santa Clara.

San Rafael, Cal.—Articles of incorporation are reported to have been filed for the Marin Terminal R. R. Co., with a capital of $1,000,000. Directors: P. S. Scales, Treas.; J. F. Bowie, B. H. Dibblee, N. W. Moran and Wm. A. Cattle. The intention of the corporation is to construct a railroad from Petaluma to Point San Pedro, and to operate from there to San Francisco via ferry.

San Diego, Cal.—At a recent meeting of the Council a street railway franchise in the eastern part of the city is reported to have been secured by Lloyd S. Ackerman, of San Francisco. The line will run from 25th and B Sts. to City Heights.

Vallejo, Cal.—Col. J. W. Hartzell, the promoter of the Vallejo & Napa Interurban Electric R. R., is reported to have a new project on hand—that of connecting the principal towns of Solano County with a chain of electric roads that will mean an expenditure of $3,000,000. It is stated that associated with him in the deal are Eastern capitalists. The route of the road will be through Vallejo, and to Benicia, Cordelia, Suisun, Fairfield, Vacaville, Dixon and Winters. The franchises have all been granted.

San Francisco, Cal.—The Bay Counties Ry. Co. is reported to have filed articles of incorporation to construct a railroad from San Francisco to Napa. Incorporators: Thos. P. Amoss, R. W. McKnight and others. Capital, $1,000,000.

Hartford, Conn.—A corps of engineers is reported to be surveying a route for the interurban line which the Hartford & Middletown St. Ry. Co. will build to connect Hartford with Middletown. Surveys will probably be completed very shortly, and arrangements will be made to begin construction in the spring.

Utica, Ind.—The construction of an electric railway from Utica, Ind., to the line of the Louisville & Southern Indiana Traction Co., connecting Jeffersonville and Jasper, Ind., is reported under consideration. Ebenezer Howes, of Utica, is interested. The proposed line is to be 8 miles in length.

Menominee, Mich.—It is stated that a proposition to build 40 miles of electric railway from Sturgeon Bay to the north end of Door County peninsula is under consideration. J. A. Brecker, of Milwaukee, Wis., is reported to be securing the right of way.

Biloxi, Miss.—It is stated that the construction of an electric railway from Biloxi to Ocean Springs is an assured fact. Judge J. H. Neville, attorney for the Gulf & Ship Island R. R., and J. P. Jones, Jr., of Gulfport, are reported to have made an inspection of the route.

Trenton, N. J.—It is stated that the Trenton, Hamilton & Ewing Traction Co. is planning to build from Trenton to Mercerville and Hamilton Sq.

Geneva, N. Y.—The Geneva, Phelps & Newark R. R. is reported incorporated, to operate a street railroad. Capital, $400,000. Stanley M. Hayes, Edward H. Palmer and L. G. Hoskins, all of Geneva, are reported interested.

Buffalo, N. Y.—The International Ry. Co. is planning to build a new line in Fillmore Ave. Plans are also under way for a new through line between Buffalo and Niagara Falls, in addition to the present double-track line.

Defiance, O.—The Defiance St. Ry. Co. is reported to have applied for a franchise to build an extension on Clinton St. to the city limits.

Roosevelt, Okla.—The Wichita Mountain Traction Co. is reported to have been chartered with a capital of $250,000, for the purpose of building an electric railway from Roosevelt to Apache, 50 miles, traversing Kiewa, Comanche and Cadde Counties, and costing $250,000. Incorporators: W. R. McKnight, Guy H. Parker, of Roosevelt; John A. McKeene, of Hobart, and others.

Portland, Ore.—The Oregon Water Power & Ry. Co. is reported to have decided to extend its line from Cedarville to Troutdale, and work will probably commence as soon as right of way is secured.

Seelyville, Pa.—W. A. Heller, of Danville, Pa., is stated to be promoting an electric street railway to operate between Seelyville and Hawley. The new road will be known as the Honesdale & Hawley Electric Ry. The road will be 12 miles in length.

Brookings, S. D.—Neil Stewart, is reported interested in the proposed electric railway from Brookings to Sioux Falls. Preliminary and location surveys are reported to have been made between Brookings and Flandreau. This line will run through Brookings, Flandreau, Corson, East Sioux Falls and Sioux Falls.

Knoxville, Tenn.—The Knoxville & Marysville Electric Ry. Co., with a capital of $100,000, is reported incorporated by W. S. Nash, Joseph P. Gant, Haywood Garrick, and others.

Houston, Tex.—The project of building an interurban electric railway between Houston and Galveston, a distance of about 61 miles, is reported to have been revived. J. O. Russ, of Houston, W. J. Moore, of San Antonio, F. L. Dana, of Galveston, and others are interested.

San Marcos, Tex.—It is stated that bids are being received for the construction of the interurban electric railway between San Marcos and Luling by the San Marcos valley Interurban Ry. Co. Judge B. G. Neighbors, of San Marcos, is Secy.

Olympia, Wash.—Articles of incorporation of the Port Angeles & Olympia Ry. Co., with a $4,000,000 capital, are reported to have been filed. Incorporators: Jacob Furth, W. D. Hofius, Lester Turner, of Seattle, and A. A. Arthur, of New York, N. Y. The object is to construct and operate a standard-gage railway from Port Angeles to a point at or near Olympia.

Chehalis, Wash.—The City Council is stated to have granted a franchise to the Centralia-Chehalis Electric Ry. & Power Co., to build an electric railway in Chehalis.

Parkersburg, W. Va.—The Parkersburg, Marietta & Interurban Ry. Co. (J. R. Davis, Ch. Engr.) is stated to have secured nearly all the required right of way for an extension to Lowell, and it is stated that the line will be built in the spring.

It is announced that the Parkersburg & Ohio Valley Ry. Co. (E. L. Benton, of Sisterville, Ch. Engr.) has sold bonds necessary to complete the line from Friendly to Sistervile, and that it will be built in the spring. Eventually the road will extend to Parkersburg.

Brantford, Ont.—It is stated that the Southwestern Traction Co., of London, intends to build a radial electric railway through Western Ontario, connecting Brantford and London.

RAILROADS.

Notes Arranged Alphabetically by States.

Pueblo, Colo.—The Denver & Beaver Ry. Co. is reported incorporated to construct a railroad from a point on the St. Francis branch of the Burlington R. R. in Kansas to Pueblo; also 100 miles of railway from Oberlin, Kan., to Wray, Colo. This company will be a branch of the Chicago, Burlington & Quincy R. R. (I. S. P. Weeks, Engr., Lincoln, Neb.)

Woodville, Fla.—The Woodville R. R. Co. is reported incorporated to construct and maintain a railroad for public service from a point near Woodville, Leon County, Fla., to a point on the Carabelle, Tallahassee & Georgia R. R., in Leon County, and also to build over the Seaboard Air Line R. R. at a point near Woodville for a distance of 60 miles; capital, $100,000. Incorporators, Thos. Hall, Emmett M. Lamb, Benj. F. and Walter M. Page, all of Woodville.

Irwinville, Ga.—The Atlanta & Birmingham Ry. Co. (W. H. Courtenay, Ch. Engr., Louisville, Ky.), it is stated, intends building a line from Irwinville to Ashburn, to connect with the Ga. Southern & Florida Ry.

Augusta, Ga.—The Augusta Southern R. R. Co. (Hamilton McWhorter, Pres., Atlanta) is reported to have under consideration the matter of repairing tracks, straightening out curves and otherwise improving the road, at a cost of about $100,000.

Des Moines, Ia.—The Chicago, Rock Island & Pacific R. R. Co. (B. L. Winchell, Pres., Chicago, Ill.) is reported to have decided to build a new line from Des Moines to Iowa City.

Two Harbors, Minn.—The Duluth & Iron Range R. R. Co. (R. Angst, Ch. Engr., Duluth) it is reported, intends this winter and in the spring expending $500,000 in extensions to its machine and repair shops, electric light plant and the building of a new coal dock. The work includes a tank shop, 80 x 144 ft., equipped with two 20-ton traveling cranes as well as modern machinery for the work required, and an addition to the machine shops, 95 x 103 ft., to accommodate a 200-ton overhead traveling crane.

Brookhaven, Miss.—The Mississippi Central R. R. Co. (L. L. Major, Vice-Pres., Hattiesburg) is reported to have decided to extend the road from Brookhaven to Natchez.

St. Louis, Mo.—F. W. Valliant, Street Comr., held a conference on Nov. 29 with C. D. Purdon, Engr., St. Louis of the Frisco R. R., and M. L. Byers, Engr., St. Louis, of the Missouri Pacific R. R., relative to preparing plans for the abolition of grade crossings at the Tower Grove station. Plans for the depression of the tracks at that point will be prepared for the joint committee on steam railroad grade crossings at once. As soon as they are completed the City Counselor will be asked to draw up an ordinance which will be presented to the Bd. of Pub. Improvements.

**Las Vegas, Nev.*—Deal Bros. & Mendenhall, of Springville, Utah, it is stated, have secured the contract to grade Senator W. A. Clark's Bullfrog R. R. a distance of 113 miles, from Las Vegas, Nev.

Utica, N. Y.—It is reported that the New York Central & Hudson River R. R. Co. (Henning Fernstrom, Ch. Engr., New York) will as soon as river straightening work is completed, expend about $1,000,000 in improvements, to include new station, overhead street crossings, new freight house, yard, etc.

Brooklyn, N. Y.—It is stated that bids will be received until Dec. 12 by the Brooklyn Grade Crossing Comn., 44 Court St., for the Bay Ridge Improv. contract. The work includes approximately 1,000,000 cu. yds. of excav., concrete abutments and retaining walls, about 15,000 cu. yds., and construction of pipe culverts and sewers. L. V. Morris, Engr. in charge, 44 Court. St.

**Lakewood, N. Y.*—The Erie R. R. has awarded the contracts for two pieces of heavy construction which are a part of the extensive grade reduction and realignment work that has been undertaken on that road. J. G. White & Co., of New York, have received a contract to build 14 miles of single-track line between Niobe and Columbus, Pa. Burke Bros., of Scranton, Pa., were awarded the contract for between 8.5 and 9 miles of double-track line between Niobe, Pa., and Lakewood N. Y. The latter contract includes about 750,000 cu. yds. of earthwork.

Buffalo, N. Y.—C. J. Parker, of N. Y. City, Engr. N. Y. Central & Hudson River R. R. Co., is reported to have prepared and presented to E. B. Guthrie, Engr. for the Grade Crossing Comn., plans for abolishing 23 of the Belt Line crossings. They will have to be approved by the N. Y. Central before they can be carried out.

Lehigh, Okla.—The Oklahoma Central Ry. Co. is reported to have decided to expend about $2,640,000 in building a railroad from Lehigh to Chickasha and $7,360,000 in buying rolling stock and terminal facilities.

Evarts, S. D.—The Chicago, Milwaukee & St. Paul R. R. (D. J. Whittemore, Ch. Engr., Chicago, Ill.) is reported to be considering the extension of its road westward from the Missouri River to the Pacific Coast. It is stated that the extension is to be from Evarts, S. D., and 1,500 miles of new track will be laid to Tacoma and Seattle, Wash. Cost is reported to be about $40,000 per mile.

Aberdeen, S. D.—The Great Northern Ry. Co. (A. H. Hogeland, Ch. Engr., St. Paul, Minn.), is reported to have in contemplation the construction of a line from Aberdeen to Rapid City.

Nashville, Tenn.—Press reports state that the Nashville & Huntsville Ry. will be a steam road, and will be constructed at first from Nashville to Birmingham via Huntsville, and then to the gulf. T. W. Pratt, of Huntsville, Ala., is reported interested.

**Roanoke, Va.*—It is reported that the contract for the construction of 110 miles of the Tidewater R. R. west from Roanoke has been awarded to MacArthur Bros. Co., of Chicago, Ill. This section includes 20 tunnels and a large amount of heavy rock work.

Tacoma, Wash.—The directors of the Chicago, Milwaukee and St. Paul R. R. Co. (D. J. Whittemore, Ch. Engr., Chicago, Ill.) are reported to have authorized the coast extension to Tacoma and Seattle, starting from Evarts, S. D., which makes the twin cities the eastern terminus. Construction is to begin at once.

Jalisco, Mex.—The Jalisco Ry. Co. is reported to have been incorporated in Portland, Me., with Fredk. Seward, of New York, N. Y., as Treas. and Director, with a capital of $7,500,000 for the purpose of buying and utilizing the concessions and contract executed by the government of Jalisco, and Melvin C. Miller for the construction of a railroad from Guadalajara to a point on the coast of the Pacific near Chamela in Jalisco, and a branch line from Guadalajara to La Solodad, Zapopan.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

**Linden, Ala.*—The Comrs. of Marengo County, it is reported, have awarded the contract to erect the jail to the Southern Construction Steel Co., of San Antonio, Tex., at $21,500.

Van Buren, Ark.—The following are reported to be the bids received for rebuilding the Crawford County Court House: G. W. Fair, Little Rock, $15,325; John T. Blevins, Van Buren, $15,000; W. A. Prather & Co., Ft. Smith, $13,972.

Denver, Colo.—The Bd. of Superv. has adopted a resolution authorizing the Mayor to sell $400,000 Auditorium bonds. A committee has been appointed of which Superv. Spengel is a member, to select a site on which to erect the Auditorium.

Washington, D. C.—The following are the bids opened on Nov. 25 by Elliott Woods, Supt. U. S. Capitol Bldgs. & Grounds, for laying the rough brick for the Senate Office Building (price given per cu. yd.). Brennan Constr. Co., foot 31st St., Washington, $3.35; Geo. Hughes, 208 Colorado Bldg., Washington, 3.54½; Ambrose B. Stannard, St. James Bldg., New York, N. Y., $3.68; Richardson & Burgess, Colorado Bldg., Washington, $4.25¼; Fissell & Wagner, Home Life Bldg., Washington, $4.73; F. G. McAuliffe, 500 D St., S. E., Washington, $4.96; and Mankin Constr. Co., 812 Main St., Richmond, Va., $6.73.

Washington Barracks, D. C.—Bids will be received at the office of the U. S. Engineer until Jan. 8 for the millwork, glass and glazing for Army War College, as advertised in The Engineering Record.

Griffin, Ga.—W. H. Wheaton, County Clk., writes that plans for the proposed court house will be considered on Dec. 28; probable cost, $50,000 to $60,000.

Milledgeville, Ga.—Bids will be received until Dec. 15 by the Prison Comn., (Jos. Turner, Chrmn.) at Atlanta, for erecting the State reformatory on the State farm, Milledgeville, to be a 2-story brick structure upon a stone foundation, and to cost about $10,000. Bruce & Everett, Archts., 711 English-American Bldg., Atlanta, Ga.

Granite City, Ill.—The Granite City Hospital Asso. it is stated, will erect a $20,000 bath house as an adjunct to its hospital. Dr. W. H. Grayson, of Granite City, Pres. Hospital staff.

Kentland, Ind.—It is reported that bids will be received until Jan. 1 by the Bd. Co. Comrs., for furnishing material and repairing courthouse, including steam heating, sewerage and electric wiring. Alonzo Epurkey, Co. Aud.

New Orleans, La.—Diboll & Owen, 217 Baronne St., it is stated, have been selected, in competition, to prepare the plans for the Public Library which is to be erected at St. Charles Ave. and Calliope St. Farrot & Livandais, 839 Gravier St., Emile Weil, 219 Carondelet St., and Rathbone E. De Buys, 421 Carondelet St., received the 2d, 3d and 4th prizes respectively, and will prepare the plans for the 3 branch libraries. Andrew Carnegie has given $250,000 for these buildings, about $214,000 of the amount to be used for the main building.

Baltimore, Md.—The following are reported to be the bids received by the Bd. of Awards Dec. 16 for erecting the Retail Market and Maryland Inst. Bldg., a 3-story structure, on Centre Market space, south of Baltimore St., bids on substructure and superstructure being submitted separately:

---

* *Items marked thus give the names of parties awarded contracts.*

Substructure—Chas. L. Stockhausen, spread-concrete method, $36,300; time 150 days; and Cranford Paving Co., of Washington, spread-concrete method, $25,600; time, 90 days; caisson method, $16,700; time, 70 days.

On the superstructure 4 different kinds of bids were asked for, described as—Plan A, outside brick work, with terra-cotta trimmings; Plan B, Indiana limestone trimmings and brick work; Plan C, entire facing to be of Indiana limestone; Plan D, alternative bid in case building is heated from outside. Chas. L. Stockhausen—A, $184,000; B, $204,172; C, $224,263; D, deduct $1,500; time, 12 mos. D. W. & G. H. Thomas—A, $183,500; B, $207,500; C, $224,500; D, deduct $1,000; time, 9 mos. Chas. McCaul & Co.—A, $173,470; B, $197,870; C, $210,970; D, deduct $1,200; time, 7 mos. J. Henry Miller—A, $177,000; B, $202,225; C, $232,796; D, deduct $1,500; time, 12 mos. Henry S. Rippel—A, $182,042; B, $202,490; C, $239,389; D, deduct $1,000; time, 9 mos. Milton C. Davis—A, $191,302; B, $220,038; C, $253,302; D, deduct $1,500, deduct $1,500; time, 12 mos. Wm. Steele & Sons—A, $188,855; B, $207,065; C, $228,972; D, deduct $1,500; time, 10 mos. Brady & Watters—A, $191,193; B, $211,193; C, $230,943; D, deduct $1,500; time, 12 mos. Benj. F. Bennett—A, $202,924; B, $236,924; C, $279,043; D, deduct $1,500; time, 12 mos., and the Henry Smith & Sons Co.—A, $195,800; B, $224,800; C, $243,800; D, deduct $1,000; time, 12 mos.

Battle Creek, Mich.—Bids will be received until Dec. 28 by Jas. Knox Taylor, Superv. Arch., Treas. Dept., Washington, D. C., for a low pressure steam heating apparatus complete in the U. S. Post Office at Battle Creek, as advertised in The Engineering Record.

Minneapolis, Minn.—W. P. Barton, Secy. Bd. Charities and Correction, writes that bids have not yet been asked for the erection of an administration building at the City Hospital, plans for which are being prepared by L. A. Lamoreaux, Lumber Exchange, to cost $60,000.

St. Paul, Minn.—It is stated that the following bids were opened Dec. 1 by the Bldg. Com. for excavating for the auditorium. It is estimated that there will be about 2,314 cu. yds. earth excav. and 12,316 cu. yds. rock excav., (*a*) earth, per cu. yd.; (b) rock, per cu. yd.; (*c*) total estimated cost: Newman & Hoy, *a* 70 cts., *b* 70 cts., *c* $10,241; Ryan & Johnson, *a* 73 cts., *b* 97 cts., *c* $13,635; Keough Bros., *a* 65 cts., *b* $1.09, *c* $14,928; James Forrestal Co., *a* $1.18, *b* $1.18, *c* $17,263; Nels J. Ness, *a* $1, *b* $1.25, *c* $17,709.

The contract for the foundation walls for the auditorium, it is reported, is soon to be let. Reed & Stern, 601 Endicott Bldg., are the Archts.

Nevada, Mo.—The holding of an election to vote on the question of erecting a court house to cost $75,000 is reported under consideration. The taxpayers are said to be in favor of this election.

Kansas City, Mo.—The Bd. Pub. Wks., it is stated, will receive bids until Dec. 20 for erecting a fire headquarters' building at Central and 10th Sts. The cost to be about $50,000.

Ft. Assinniboine, Mont.—Bids will be received until Dec. 30 by Capt. J. B. McDonald, Constr. Q. M., Ft. Assinniboine, for constructing a brick cavalry stable, for 73 horses, plan 54 H; and also a bacterial sewage purification plant, plan spl. 2-707, at Ft. Assinniboine.

Omaha, Neb.—It is reported that the Council has passed an ordinance authorizing the issue of $60,000 bonds for the construction of a fire engine house.

Utica, N. Y.—Bids will be received by the State Comn. in Lunacy, Albany, until Dec. 13 for additions to plumbing, Administration Bldg., Utica State Hospital, as advertised in The Engineering Record.

Buffalo, N. Y.—Bids will be received by the State Comn. in Lunacy at Albany, until Dec. 13, for alterations to plumbing, Administration Bldg., Buffalo State Hospital, as advertised in The Engineering Record.

New York, N. Y.—Plans have been filed for a 3-story br. and stone hook and ladder house for the City of New York, to be erected at 135th St. and Lenox Ave., at a cost of $34,000. Bernstein & Bernstein, Archts., 24 E. 23rd St.

New York, N. Y.—Plans have been filed for alterations to the Stauger Rheumatism & Gout Institute, at 149 E. 67th St., to cost $43,000; W. B. Tuthill, Archt., 287 4th Ave.

*The following are the bids opened on Oct. 17 by the Dept. of Pub. Charities for furnishing material and erecting complete the municipal lodging house at 1st Ave. and 25th St.; (*a*) 120 days to complete, (*b*) 240 days to complete: Buckley Realty Constr. Co., Times Bldg., *a* $345,000, *b* $331,000; Church Constr. Co., Bway. and 23d St., *a* $315,000, *b* $273,000 (awarded contract); Thos. Cockerill & Son, 147 Columbus Ave., *a* $375,000; Patrick Gallagher, 1181 Bway., *a* $290,641; John H. Parker Co., 225 4th Ave., *a* $349,000,, *b* $311,000; Daniel J. Ryan, 723 3rd Ave., Brooklyn, *a* $281,000, *b* $275,000; John R. Sheehan & Co., 160 5th Ave., *b* $318,000.

Brooklyn, N. Y.—Plans have been filed for a 1-story brick lavatory to be erected by the Dept. of Parks in Ft. Greene Park near Myrtle Ave. and Cumberland St., at a cost of $25,000. Archts., McKim, Mead & White, 160 5th Ave., N. Y. City.

The Bd. of Estimate on Dec. 5 passed an ordinance authorizing Martin W. Littleton, Pres. Brooklyn Boro., to employ McKim, Mead & White, 160 5th Ave., N. Y. City, as Archts. for the new municipal building; also an ordinance appropriating $500,000 for preliminary work in connection with the new municipal building, the total cost of which is to be about $4,164,000.

Bids will be received until Dec. 20 by Martin W. Littleton, Pres. Boro. Brooklyn, for furnishing material and erecting a public bath at 4th Ave. and President St.

Goshen, N. Y.—Bids will be received until Dec. 11 by J. E. Sanford, Co. Treas., for $30,000 courthouse bonds.

Ft. Wood, N. Y. Harbor, N. Y.—Bids will be received until Dec. 26 by G. C. Burnell, Constr. Q. M., Governor's Island, N. Y. H., for constructing a post hospital at Ft. Wood.

Woodsfield, O.—It is stated that plans and specifications will be received until Dec. 18 by the Bldg. Com. for a court house.

Akron, O.—Bids will be received by the Bd. Co. Comrs. until Jan. 2 for erecting a ward building at the Summit Co. Infirmary. Bids on material and labor to be submitted separately. Milton E. Harpster, Archt., 56 Central Savgs. & Trust Bldg.,; M. D. Buckman, Co. Aud.

**Enid, Okla.*—J. F. Danely, County Clk., writes that the contract for erecting a court house (bids opened Nov. 28) has been awarded to A. O. Campbell, of Oklahoma City, for $90,000.

Philadelphia, Pa.—The following are reported to be the bids received Dec. 2 by Lieut. Col. R. L. Hoxie, Corps Engrs., U. S. A., at Philadelphia, for erecting a dwelling, oil house, and barn at the Reedy Island Range Rear Light Station, Del.: Fred A. Havens & Co. bid $14,833, according to the specifications, and Jas. H. Stitzer, Jr., $14,500 provided certain changes were allowed in the specifications.

Philadelphia, Pa.—Bids will be received by Maj. John T. Knight, Q. M. U. S. A., Schuylkill Arsenal, until Dec. 21, for constructing, plumbing, heating, etc., office building here, as advertised in The Engineering Record.

Sparta, Tenn.—Bids, including plans and specifications, will be received until Dec. 22 by the Jail Com. (D. G. Brown, Chmn.) for erecting a jail.

Dallas, Tex.—The citizens have voted to issue $27,500 jail bonds. L. S. Bristol, Building Inspector.

Norfolk, Va.—Bids will be received by the Associated Architects and Engineers, of the Jamestown Exposition Co., until Dec. 16, for the erection of the Administration Building, as advertised in The Engineering Record.

Friday Harbor, Wash.—The erection of a brick or stone court house, to cost about $30,000, is reported to be under consideration.

Seattle, Wash.—Bids will be received until Dec. 21 by the Bd. Co. Comrs. (P. J. Smith, Chmn.) for $80,000 armory bonds.

Sheboyan, Wis.—Frank J. E. Brabant, 79 Dearborn St., Chicago, Ill., has prepared plans for a fire station, to be erected here, at a cost of $15,000.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

Birmingham, Ala.—It is reported that a 12-story hotel is to be erected here by the Jefferson Constr. Co. (W. H. Woodward, Pres.).

Montgomery, Ala.—N. J. Bell, it is stated, is contemplating the erection of a 4-story brick or concrete building at Montgomery and Lee Sts., to cost about $50,000. It is reported that no archt. has been engaged as yet.

**Decatur, Ala.*—Chas. Jones, it is reported, has secured the contract to erect 10 additional stalls in the roundhouse for the Louisville & Nashville R. R., the cost to be $17,500.

Palo Alto, Cal.—The Leland Hotel Co., it is reported, has been incorporated with a capital of $100,000 for the purpose of erecting a hotel here. P. M. Woster, of San Francisco, and J. F. Parkingson, of Palo Alto, are the incorporators.

Berkeley, Cal.—Percy S. Hudson, it is reported, is interested in a company which proposes erecting a $100,000 hotel to be known as University Court.

San Francisco, Cal.—John C. Pelton, Crocker Bldg., it is stated, has prepared plans for a 10-story granite, brick and terra cotta building, which is to be erected at 2d and Natoma Sts.

**Denver, Colo.*—Brown & Schrepferman, Continental Bldg., it is stated, have secured the general contract for the building for the Morey & Boettcher Co., which is to be erected at Wazee and 16th Sts., the cost of the building complete to be about $120,000.

It is reported that the Denver Dry Goods Co. intend erecting an 8-story fireproof building, to cost $700,000, at 16th and California Sts.

B. F. Drinkwater, it is stated, intends erecting a 4 or 6-story building at 15th and Welton Sts., to cost about $150,000.

Atlanta, Ga.—Sam. M. Inman, a N. Y. capitalist, it is reported, intends erecting several buildings at Mitchell St. and Madison Ave., including a 5-story building. The total cost, it is stated, will be about $100,000.

Savannah, Ga.—It is stated that a site has been secured, bounded by Bull, Charlton, Drayton and Macon Sts., on which the Y. M. C. A. proposes erecting a $100,000 building.

Weiser, Idaho—Ross Carter, of Boise, it is stated, is preparing plans for a $30,000 opera house, which is to be erected on State St., Weiser, by W. W. Wheaton. It is to be a 3-story and basement structure, 62 x 110 ft.

Chicago, Ill.—Julian Barnes has designed for the Ashland Deposit Co., of which Wakely & Flick are the proprietors, a 2 story bank and hall building, 30x100 ft., to be erected at 1710 W. 63d St., near Ashland Ave. Cost $30,000.

E. R. Krause has designed for Mrs. Augusta Lehmann an 8 story warehouse, 60x143 ft., to be erected on State and 14th Sts., of pressed brick and cost $100,000.

It is stated that a 10-story club house is to be erected by the members of the Chicago Club at Michigan Ave. and Van Buren St. at a cost of $1,000,000. It is reported that plans are to be submitted for approval in February.

It is stated that a 6-story building, 80 x 172 ft., costing about $500,000, is to be erected at 246 Michigan Ave., for the Chicago Musical College, 202 Michigan Ave.

W. Carbys Zimmerman, 21 Van Buren St., is preparing plans for remodeling the 5-story office building, 155 x80 ft., at 5th Ave. and Lake St., for Daniel F. Crilly, 167 Dearborn St.

Muncie, Ind.—The erection of a Y. M. C. A. bldg., to cost about $75,000 is reported under consideration.

Clinton, Ind.—J. C. Blackledge, it is reported, has organized a company to buy and remodel the Clinton hotel. The estimated cost of remodeling is reported to be $35,000.

Rockwell City, Ia.—The American Life Insurance Co., of Des Moines, it is reported, has decided to erect a $25,000 hotel.

Des Moines, Ia.—The Waterbury Chemical Co., it is reported, is preparing to erect a $30,000 business building at E. 2d and Locust Sts.

Louisville, Ky.—Claflin & Co., of New York, N. Y., it is stated, intend erecting a 6 or 8-story store and office building at 4th Ave. and Walnut St., to cost about $250,000.

The United Brothers of Friendship and Sisters of the Mysterious Ten, colored organizations, it is reported, are to erect a 3-story store and club building at 9th and Magazine Sts., to cost about $49,000. Plans have been prepared.

Lawrence, Mass.—Boston & Maine R. R. is to build 2 freight houses at Lawrence, each 600 ft. in length, and is to construct entirely new freight yards.

**Boston, Mass.*—W. A. & H. A. Root, 166 Devonshire St., are stated to have secured the contract for additions to the brick factory of the Gillette Safety Razor Co., at South Boston (bids opened Dec. 1) for $65,000. Kendall, Taylor & Stevens, Archts., 93 Federal St.

*Geo. W. Harvey Co., 24 Milk St., have secured the contract for constructing an addition to the storage warehouse of the New England Storage Warehouse Co., in Roxbury, for about $100,000. Archt., Wm. G. Preston, 186 Devonshire St.

Two Harbors, Minn.—See "Railroads."

Meridian, Miss.—The Scottish Rite Masons (B. V. White, Secy.) it is reported, have decided to erect a $50,000 building.

Kansas City, Mo.—The Missouri Pacific R. R. Co. (E. K. Carnes, Supt. Terminals, Kansas City), it is stated, intends making numerous improvements in this city, including the erection of 2 freight houses, 1 for inbound freight and the other for outbound freight. It is stated that a permit has been granted for the outbound freight house, which is to be erected on St. Louis Ave. and Liberty St., and is to be structural iron and brick, with terra cotta trimmings, and is to be 1,200 ft. long, 38 ft. wide and 2 stories high and to cost about $207,000. The inbound freight house is to be erected south of the outbound, and will be 600 ft. long and 40 ft. wide. Among other improvements will be the installation of a traveling crane operated by electricity and running on a track 1,000 ft. long. It is to be capable of lifting anything from 10,000 to 60,000 lbs. It is reported that contracts for the foundations for the buildings have been awarded.

**St. Louis, Mo.*—The Morrison Constr. Co., 113 N. 8th St., it is reported, has secured the contract to erect a 4-story brick mercantile building for John McKenna at 1426 Pine St., the cost to be $40,000.

Louis A. Cella, it is stated, intends erecting a 14-story office building at 7th and Chestnut Sts., to cost about $500,000. It is reported that no archt. has been selected as yet. Judge Henry W. Bond, it is stated, is attorney for Mr. Cella.

*It is reported that a 14-story office building is to be erected at Chestnut and 8th Sts., according to plans prepared by Eames & Young, Chestnut and 7th Sts., at a cost of $700,000. The Jas. Black Masonry & Contr. Co., Commercial Bldg., are the builders.

Butte, Mont.—Harry Symons, of the Symons Dry Goods Co., it is reported, has announced that the erection of a cement fireproof structure on the site of the burned building is under consideration.

**South Omaha, Neb.*—The Jetter Brewing Co., it is reported, has awarded the contract to erect an $18,000 office building to McDonald & Brock, of South Omaha.

Omaha, Neb.—Rome Miller, it is reported, is forming a company for the purpose of erecting an 8-story hotel at 17th and Douglas Sts., at a cost of about $500,000.

*The Capital City Pipe & Brick Co., it is stated, has secured the contract to erect the Hillis Bldg., at 10th and Douglas Sts., at about $20,000.

Courtney & Co., it is reported, have purchased a building at 17th and Harney Sts., and will make improvements at a cost of about $25,000.

Prattville, N. Y.—Miller & Martin, of Utica, it is reported, are preparing plans for a 4-story brick building to be erected in Prattville, at a cost of $35,000.

Utica, N. Y.—See "Railroads."

New York, N. Y.—It is reported that the erection of a 12-story annex to the Masonic Temple at 46 W. 24th St. is contemplated by the Masonic fraternity.

Plans have been filed with Buildings Supt. Hopper by M. M. O'Brien, Archt., of the New York Central R. R. Co., for a new passenger station for Marble Hill, to be erected in 225th St., on the line of the New York Central & Hudson River R. R.

Brooklyn, N. Y.—It is stated that plans have been filed for a 2-story brick bank to be erected at Montague and Court Sts., at a cost of $100,000. Owner, Title Guarantee & Trust Co., 175 Remsen St.; archt., F. Freeman, 132 Nassau St., N. Y. City.

Cincinnati, O.—The Cincinnati Traction Co. has acquired a site at Town and 3d Sts., and it is stated intends erecting a passenger station for the interurban roads entering the city.

Cleveland, O.—The Lodge of Elks, it is stated, have secured a site on Bond St., and intend erecting a $100,000 building.

It is stated that it is proposed to erect a building on Doan St., for the Woodward Lodge No. 508, F. and A. M., the cost to be about $27,000.

Altoona, Pa.—The officials of the Pennsylvania R. R. (W. H. Brown, Ch. Engr., Philadelphia) it is stated, are having plans prepared for a $100,000 freight station, which is to be erected in this city.

St. Clair, Pa.—Paul A. & Seymour Davis, 3d, Philadelphia, it is stated, are preparing plans for a $50,000 bank to be erected for the Citizens' Natl. Bank at St. Clair.

Lorane, Pa.—The Neversink Distillery Co., it is reported, is contemplating the erection of a new laboratory and warehouse.

**Philadelphia, Pa.*—A building permit has been granted to John R. Wiggins & Co., 721 Heed Bldg., to erect a 2-story addition to the Record Publishing Co.'s building on Ludlow St., the cost to be $20,000.

Pittsburg, Pa.—It is reported that a fire on Nov. 30 destroyed the 5-story building of the Graff Stove & Range Co., at 909 Liberty Ave.

MacClure & Spahr, Keystone Bldg., it is reported, are preparing plans for a $100,000 club house which is to be erected by the Commonwealth Real Estate Co. and the University Club.

**Items marked thus give the names of parties awarded contracts.*

Charleston, S. C.—The Charleston Improv. Co., it is stated, intends erecting a store building at King and Society Sts., at a cost of $20,000.

Galveston, Tex.—It is reported that a 4-story building is to be erected here by the German Societies as a hotel for immigrants. It is to be known as St. Raphael House, and Rev. B. Held, of the St. Benedict Order, may be able to give further information.

Norfolk, Va.—It is stated that the Woodmen of the World of this city are contemplating the erection of a building at the Jamestown Exposition, probably of granite, to cost about $50,000.

Walla Walla, Wash.—It is reported that $50,000 is available for the erection of a Y. M. C. A. bldg.

Seattle, Wash.—Philip J. Grady, it is stated, is promoting the erection of an exhibition building in this city, to cost about $250,000.

J. J. Donnellan, it is reported, has completed plans for remodeling the Star Theatre, at a cost of $20,000.

Aberdeen, Wash.—It is stated that a new exchange building, to cost about $20,000, is to be erected here by the Sunset Telephone Co. John Nelson, of Seattle, may be able to give further information.

Spokane, Wash.—J. D. Finley, it is stated, has purchased a site at Main Ave. and Washington St. and intends erecting a 3-story brick building, to cost $30,000.

Menasha, Wis.—Christ. Walter, it is reported, is contemplating the erection of a $50,000 hotel.

Casper, Wyo.—The citizens, it is reported, has decided to erect a $15,000 opera house.

Winnipeg, Man.—The Brown Blk., it is stated, has been destroyed by fire.

Halifax, N. S.—It is stated that efforts are being made to amalgamate the Halifax and City Clubs and to erect a $75,000 building.

New York, N. Y.

24th St. and 3d Ave., 6-story br. and stone stable; c, $500,000; o, The Centaur Realty Co.; a, Horgan & Slattery.

138th St. and Cypress Ave., 5-story br. stores and tenemts.; c, $50,000; o, Harry Goodstein; a, Maximilian Zipkes.

187th St. and Cambrelling Ave., 5-story br. store and tenemt.; c, $50,000; o, P. J. Moffatt; a, Goldner & Goldberg.

34th St. and 5th Ave., 6-story br. and stone department store; c, $90,000; o, Robt. S. Smith; a, Saml. Sass.

102 W. 38th St., 9-story br. and stone loft bldg.; c, $120,000; o, Jos. W. Stern & Co.; a, Wm. Sommerfeld.

70th St. and 1st Ave., 6-story br. and stone store and tenemt.; c, $150,000; o, Abraham D. Weinstein; a, Horenburger & Straub.

94th St. and 1st Ave., 3 6-story br. and stone stores and tenemts.; total c, $150,000; o, Navasky & Billowitz; a, Bernstein & Bernstein.

103d St. and 3d Ave., 4 6-story br. and stone stores and tenemts.; total c, $140,000; o, Julius Weinstein; a, Bernstein & Bernstein.

120th St. and 1st Ave., 2 6-story br. and stone stores and tenemts.; total c, $80,000; o, Greenfield & Maskin; a, Bernstein & Bernstein.

123d St. and Lexington Ave., 6-story br. and stone store and tenemts.; c, $35,000; o, Louis Reiner; a, B. W. Levitan.

3d Ave. and 103d St., 6-story br. and stone store and tenemt.; c, $50,000; o, Barnett Cohen; a, Bernstein & Bernstein.

67th St. and Columbus Ave., 10-story br. and stone studio bldg.; c, $200,000; o, R. W. Vonnoli; a, Pollard & Steinam.

107th St. and Amsterdam Ave., 6-story br. and stone store and tenemt.; c, $50,000; o, Irving Judis; a, B. W. Levitan.

159th St. and Courtland Ave., 6-story br. stores and tenemts.; c, $60,000; o, Saml. Williams; a, Geo. F. Pelham.

148th St. and Morris Ave., 2 6-story br. stores and tenemts.; total c, $90,000; o, Garabaldi Realty Constr. Co.; a, Louis C. Maurer.

120 W. 20th St., 7-story br. and stone store and loft bldg.; c, $46,000; o, Walsh & McGuckin; a, C. Abbott French.

18 W. 40th St., 9-story br. and stone club house; c, $300,000; o, New York Club; a, H. J. Hardenbergh.

117th St. and Pleasant Ave., 6-story br. and stone store and tenemt.; c, $40,000; o, Louis Reimer; a, B. W. Levitan.

2d Ave. and 126th St., 3 6-story br. and stone tenemts. and stores; total c, $115,000; o, Small & Meryash; a, Horenburger & Straub.

5th Ave. and 138th St., 3 6-story br. and stone stores and tenemts.; total c, $135,000; o, Levine & Son; a, Bernstein & Bernstein.

132d St. and St. Ann's Ave., 2-story br. factory; c, $20,000; o, Ricca & Son; a, Albert E. Davis.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

Los Angeles, Cal.—Lee A. Phillips, it is reported, will erect a $40,000 residence at Berkeley Sq.

Jacksonville, Ill.—B. H. Merrill will erect a 4-story flat with elevator, etc.

Chicago, Ill.—L. M. Mitchell, 145 La Salle St., has prepared plans for a 3 story apartment, 78x63 ft., to be erected at Howe and Center Sts. by Sherman T. Cooper. it will be of pressed brick and stone, heated with steam, and will cost $40,000.

Tulsa, Ind. Ter.—It is reported that the trus. of the South Methodist Church, have decided to erect an edifice to cost $25,000. Address Pastor.

Madrid, Ia.—It is stated that the members of the Lutheran Church of Iowa and Missouri have decided upon Madrid, as a site for the home for the aged which they propose erecting at a cost of $20,000.

Minneapolis, Minn.—The directors of the Lakewood Cemetery Assoc., it is stated, are considering plans recently received for a chapel to be erected in Lakewood Cemetery at a cost of about $40,000.

Brooklyn, N. Y.—It is stated that plans have been filed for a 4-story brick tenemt., which is to be erected at McDonough St. and Sumner Ave., at a cost of $25,000. H. B. Hill, 329 Decatur St., is the owner. F. S. Loew, 186 Remsen St., is the archt.

New York, N. Y.—Plans have been filed for a 2-story concrete and stone church to be erected at 434 W. 36th St., for the Franciscan Fathers, at a cost of $35,000. N. Serracino, Archt., 1133 Bway.

Brooklyn, N. Y.—Plans have been filed for a 4-story brick tenement to be erected at Sumner and Jefferson Aves., at a cost of $25,000. Owner, Eisenbach Realty Co., 924 Bway. Archt., W. Debus, Bway. and Ellery St.

Mansfield, O.—It is reported that plans have been completed for an apartment house which is to be erected by E. M. Wolff, at a cost of $25,000.

Bowling Green, O.—It is stated that the members of the Church of Christ intend erecting a new edifice at Church and Washington Sts. to cost about $20,000.

Knoxville, Tenn.—The congregation of the 2d Presbyterian Church, it is reported, has secured a site and intends erecting a new edifice. Address the Pastor.

Ft. Worth, Tex.—The congregation of the College Ave. Baptist Church, it is reported, has decided to erect a $35,000 edifice. Rev. F. Masters, Pastor.

Norfolk, Va.—A. Brant, it is reported, has purchased a site at Church, near 30th Sts., on which he proposes erecting a $45,000 residence.

New York, N. Y.

13th St. and Ave. C, 6-story br. and stone tenemt.; c, $45,000; o, Saml. Golding; a, Saml. Sass.

109 E. 40th St., 4-story br. and stone residence; c, $50,000; o, a and b, Ernest Flagg.

24 E. 104th St., 6-story br. and stone tenemt.; c, $25,000; o, R. Eisenstein and Chas. Kramer; a, Harry Zlot.

160th St. and Bway., 6 5-story br. and stone tenemt.; total c, $252,000; o, Kleinfeld & Rothfeld; a, E. A. Meyers.

173rd St. and St. Nicholas Ave., 2 5-story br. and stone tenements, total c, $70,000; o, Mutual Constr. Co.; a, Jacob H. Amsler.

St. Nicholas Ave. and 153rd St., 6-story br. and stone tenemt.; c, $95,000; o, Marion Miller; a, Geo. F. Pelham.

156th St. and Trinity Ave., 2 6-story br. tenemts.; total c, $110,000; o, Chas. Liberman; a, Bernstein & Bernstein.

163rd St. and Prospect Ave., 2 5-story br. tenemts.; total c, $80,000; o, Alex. Grant; a, Harry T. Howell.

3rd Ave. and 178th St., 2 6-story br. tenemts.; total c, $80,000; o, Northwestern Realty Co.; a, Wm. C. Sommerfeld.

106 Mulberry St., 6-story br. and stone tenemt.; c, $48,000; o, Israel Lippman; a, E. A. Meyers.

18th St. and Ave. A, 6-story br. and stone tenemt.; c, $58,500; o, Furman, Weltfish & Gertner; a, Geo. F. Pelham.

119th St. and Pleasant Ave., 2 6-story br. and stone tenemts.; total c, $90,000; o, Epstein & Cohen; a, Bernstein & Bernstein.

112th St. and Bway., 2 6-story br. and stone tenemts.; total c, $110,000; o, Kleinfeld & Englesberg; a, Stern & Morris.

121st St. and Amsterdam Ave., 6-story br. and stone tenemt.; c, $90,000; o, J. H. Davis; a, Geo. F. Pelham.

Bway. and 122d St., 6-story br. and stone apartment house; c, $150,000; A. C. & H. M. Hall Realty Co.; a, Neville & Bagge.

954 5th Ave., 2 6-story br. and stone dwelling; c, $250,000; o, Jas. H. Harding; a, C. P. H. Gilbert.

131st St. and Amsterdam Ave., 6-story br. and stone tenemt.; c, $30,000; o, Wynne & Reggle; a, Neville & Bagge.

137th St. and Lenox Ave., 6-story br. and stone tenemt.; c, $60,000; o, Benjamin Lisserman; a, Geo. F. Pelham.

139th St. and 5th Ave., 3 6-story br. and stone tenemts.; total c, $123,000; o, Hamburger & Hyman; a, Ed. A. Meyers.

156th St. and Bway., 6-story br. and stone tenemt.; c, $60,000; o, Nicholl & Merksemer; a, Geo. F. Pelham.

175th St. and Amsterdam Ave., 2 5-story br. and stone tenemt.; total c, $76,000; o, Landin & Stamm; a, Geo. F. Pelham.

179th St. and Amsterdam Ave., 5-story br. and stone tenemt; c, $48,000 o, Louis Mayer; a, Ed. A. Meyers.

8th Ave. and 149th St., 2 6-story br. and stone tenemt.; total c, $85,000; o, Louis Weinstein; a, Rouse & Sloan.

138th St. and Cypress Ave., 5 5-story br. tenemts.; total c, $200,000; o, Harry Goodstein; a, Maximilian Zipkes.

153d St. and Melrose Ave., 2 6-story br. tenemts.; total c, $100,000; o, Chas. Zimmerman; a, A. Millner.

Forest Ave. and 163d St., 5-story br. tenemt.; c, $62,000; o, E. Solomon; a, Benj. W. Levitan.

16 E. 57th St., 7-story br. and stone residence; c, $80,000; o, W. Storrs Wells; a, John Russell Pope.

92d St. and 3rd Ave., 3 6-story br. and stone tenemt.; total c, $129,000; o, B. Hamberger; a, Ed. A. Meyers.

141st St. and Amsterdam Ave., 12 3-story br. and stone residences; total c, $216,000; o, Picken Realty Co.; a, John Hauser.

Hoe Ave. and 167th St., 2-story br. dwelling; c, $22,000; o, Lewis & La Velle; a, Wm. F. La Velle.

Prospect Ave. and 156th St., 2 5-story br. tenemts.; total c, $75,000; o, H. Marks; a, Benj. W. Levitan.

Tinton Ave. and 166th St., 4 5-story br. tenemts.; total c, $150,000; o, Thos. J. Quinn; a, Harry T. Howell.

Union Ave. and 168th St., 2 5-story br. tenemts.; total c, $90,000; o, Markransky & Applebaum; a, Geo. F. Pelham.

577 150th St., 5-story br. tenemt.; c, $60,000; o, Aitkin Constr. Co.; a, C. H. Schumann.

151st St. and Morris Ave., 2 6-story br. tenemts.; total c, $76,000; o, Evans & Cohen; a, Geo. F. Pelham.

Arthur Ave. and Belmont Pl., 2 6-story br. tenemts.; total c, $120,000; o, Pasquale Garginlo; a, Lorenz T. J. Weiher.

Boston Rd. and 166th St., 6-story br. tenemt.; c, $85,000; o, Meisel, Heimberg & Perlitch; a, Geo. F. Pelham.

SCHOOLS.

Notes Arranged Alphabetically by States.

**San Francisco, Cal.*—M. C. & P. J. Lynch, 40 New Montgomery St., it is stated, have secured the contract to erect the Washington Grammar school at $114,925.

The bid of P. P. Quinn (the second lowest bidder) for erecting the Laguna Honda school, at $54,924, is under consideration for award.

All bids received at the same time as above schools for erecting the Sunnyside School have been rejected, as they exceeded the estimated cost, which is $54,000. It is stated new bids will be asked.

Dubuque, Ia.—Buechner & Orth, Manhattan Bldg., St. Paul, Minn., are preparing plans for three schools to be erected at Dubuque, one to contain 16 rooms, one 10 rooms and one 8 rooms.

Lincoln, Neb.—It is stated that bids will be received until Dec. 16 by J. I. Wyer, Library Hall, State Univ., for erecting temple building; separate bids will be received for steam heating, plumbing and electric wiring. John Latenser, Archt., Omaha.

Hasbrouck Heights, N. J.—It is stated that bids will be received until Dec. 13 by Frank S. Flagg, Chmn. Bldg. Com. Bd. Educ., for erecting a 14-room brick school, to cost about $60,000. Walker & Morris, 24 E. 23d St., New York, N. Y., are the Archts.

Newark, N. J.—It is stated that the Com. on School houses of the Bd. of Educ., will receive competitive plans for the Technical High School until about Jan. 15.

Plainfield, N. J.—Major Duncan, head of the Military School at Freehold, it is stated, has purchased a site on Prospect Ave., adjoining Rahway road, in Plainfield, and has had plans prepared for a school 100 x 60 ft., to be erected at a cost $50,000.

Gloversville, N. Y.—Jas. W. Rice, Secy. Bd. of Educ., writes that new bids will be received until Dec. 13 for the erection of a high school to cost complete $100,000. Architect, Wilson Potter, 3 Union Sq., N. Y. City.

New York, N. Y.—Bids will be received until Dec. 15 by C. B. J. Snyder, Supt. School Bldgs., for installing ventilating and heating apparatus in School 3; also for alterations in and additions to School 10, both in Boro. Manhattan.

**Brooklyn, N. Y.*—The following are the bids opened on Dec. 4 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for general construction, etc., of School No. 8, Brooklyn Boro.: Arci Constr. Co., 192a S. 9th St., $184,900 (awarded contract); Chas. H. Peckworth, $189-655; Thos. Cockerill & Son, $214,900; Geo. Hildebrand, $198,780; H. M. Weed & Co., $194,398; Thos. McKeown, $217,400; P. J. Brennan, $189,933; Clarke & Stowe, $186,600; Wm. Werner, $188,229, and Richard E. Heningham, $190,495.

**Troy, N. Y.*—M. H. Cavanaugh, it is stated, has secured the contract for the B'way approach to the Rensselaer Polytechnic Inst. (bids for which were opened Dec. 4 by the Bd. of Contract & Supply) at $43,430. Barre granite is to be used.

Flushing, L. I., N. Y.—Bids will be received until Dec. 18 by C. B. J. Snyder, Supt. School Bldgs., New York City, for the general construction, etc., of addition to School 25, Flushing, Boro. Queens.

Akron, O.—J. F. Barnhart, Clk. Bd. Educ., writes that it is proposed to erect a high school annex, at a cost of from $75,000 to $100,000. No architect engaged as yet.

**Corvallis, Ore.*—J. R. Wilson, of Albany, it is reported, has secured the contract for the foundation work on the Y. W. C. A. bldg., which is to be erected on the campus at the Oregon Agricultural College at Corvallis, the total cost of which is to be about $15,000.

Indiana, Pa.—The boys' dormitory at the Indiana State Normal School, it is stated, has been destroyed by fire.

Dallas, Tex.—The citizens have voted to issue $150,000 bonds for a high school and $50,000 for a ward school. T. G. Terry, Secy. School Bd.

Local press reports state that plans for the high school will be received until Jan. 15. Address T. G. Terry, Secy. School Bd.

Paris, Tex.—It is stated that bids are wanted Dec. 20 for the erection of a 3-story brick and stone high school. T. C. Bishop, Mayor.

Jacksonville, Tex.—The citizens of the Independent School Dist., it is stated, have voted in favor of issuing $25,000 bonds, the proceeds to be used to erect schools.

Sprague, Wash.—L. L. Rand, Rookery Bldg., Spokane, is preparing plans for a $15,000 school for Sprague.

Seattle, Wash.—It is reported that $500,000 school bonds have been sold.

Chippewa Falls, Wis.—There is some talk of erecting a new high school here, but nothing definite has yet been done.

**Keshena, Wis.*—W. D. Lovell, Minneapolis, Minn., it is stated, has secured the contract to erect the Menomonee School at the Green Bay Agency, Wis., at about $31,930.

Fond du Lac, Wis.—The Common Council, it is stated, has agreed to erect a school at Walker and Military Sts. A building to cost $25,000 is reported under consideration.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

New Britain, Conn.—During the month of May, bids will be received for the collection of garbage. F. H. Oldershaw, City Engr.

Lexington, Ky.—Bids will be received by Thos. A. Combs, Mayor, until Jan. 4, for the erection and completion of a garbage destructor (or incinerator) with a capacity of not less than 50 tons in 12 hours, as advertised in The Engineering Record.

**Rochester, N. Y.*—The following are reported to be the bids opened on Nov. 29 by the Bd. of Contract for collecting the garbage for next year: W. A. Hartung, $35,685 (awarded contract); Wm. H. Sours, $33,934; Charles L. Horn, $36,250; Grand Avenue Horse Co., $41,500, and Geo. Bantel's Sons, $42,000.

Brooklyn, N. Y.—The following are the bids opened on Dec. 6 by John McG. Woodbury, Comr. Street Cleaning, N. Y. City, for furnishing all labor and material required for the removal of snow and ice in Brooklyn Boro. (price given per cu. yd.): Wm. Bradley, 86th St. and Bway., N. Y. City, 21½ cts.; Donlon Contr. Co., Brooklyn, 26 cts. and Newman Contr. Co., 22 cts.

York, Pa.—Bids will be received until Dec. 13, by E. F. Weiser, Clk., Highway Com., for the collection and disposal of organic garbage for the period of 5 years, from April 2, 1906.

---

* *Items marked thus give the names of parties awarded contracts.*

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

The Waterbury Chemical Co., Des Moines, Ia., will build an extensive addition to its plant in the spring.

Essex Foundry, Newark, N. J., is building an addition to its plant which will increase its floor space 8,500 sq. ft.

The Standard Machinery Co., Bowling Green, Ohio, has purchased site for a new plant, according to local newspaper reports.

H. P. Gilpin Co., Baltimore, Md., mfrs. of chemicals, will erect a new factory building, according to local newspaper reports.

Virginia Pipe & Foundry Co., Richmond, Va., will shortly begin the erection of a new plant, according to local newspaper reports.

Kansas City (Mo.) Oil & Gas Co. is preparing plans for a 300-bbl. oil refinery and two tanks with a capacity of 20,000 bbls. each. Bids will be asked for in a few days.

William Kelly, Hutchinson, Kan., is preparing to erect a new flour mill at that place, involving an expenditure of $40,000, according to local newspaper reports.

Holston Zinc Co., Knoxville, Tenn., is preparing to install a 400-ton mill at Mascot, Tenn., to replace the 50-ton mill now there, according to local newspaper reports.

The Atchison, Topeka & Santa Fe Ry. Co. is preparing plans for a large grain elevator to be built at Chicago, Ill. W. B. Storey, Jr., Chief Engineer, Topeka, Kan.

Kelly Axe Mfg. Co., Charleston, W. Va., has in hand plans for additions to its present plant, which will make it the largest of its kind in the world, according to local newspaper reports.

Fort Wayne Automobile Co., Detroit, Mich., is erecting a new plant to consist of main factory building, testing building, boiler and engine room, etc., according to local newspaper reports.

The Colorado Fuel & Iron Co., Denver, Colo., is contemplating improvements at its Pueblo plant which will necessitate the expenditure of about $10,000,000, according to local newspaper reports.

The Marinette & Menominee Paper Co., Appleton, Wis., will begin at once the rebuilding of its plant, which was recently destroyed by fire, according to local reports; the new plant to cost $300,000.

The Union Bag & Paper Co., Troy, N. Y., whose plant was destroyed by fire a short time ago, will rebuild as soon as the insurance has been adjusted, according to local newspaper reports.

The Athens (Ala.) Cotton Mill Co. will build a 60 x 75 ft. addition to its plant and install 2,500 new spindles. This company is in the market for a 100-h.-p. Scotch marine boiler, delivery to be made by December 24th.

Renner & Weber Brewing Co., Mansfield, Ohio., will make extensive improvements and additions to their present plant. These improvements include a new power house, ice-making plant, etc., according to local newspaper reports.

Frank W. Coburn, Jr., is preparing plans for a plant to be erected at Farmington, N. H., for the manufacture of cutlery. The new factory will be 50 ft. square and will be operated by water power, a 25-h.-p. wheel being required.

The Maryland Wood Fiber, Plaster & Supply Co., Cumberland, Md., has purchased an old plant at that point and is remodeling same for the manufacture of wood fiber, plaster and supplies, concrete building blocks, brick, tiles, etc. according to local reports.

U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J., is preparing plans for a new 150 x 130 ft. steel-frame building. This building will be equipped with electric traveling cranes, cupola, charging platform, etc. Plans are also under way for a new machine shop and power plant.

The Art Portland Cement Co., Syracuse, Ind., recently incorporated, has acquired site near Kimmell, Ind., and will erect a Portland cement plant having a capacity of 500 bbl. per day. A 600 h.p. power plant will be required. Geo. W. Miles and Melville N. Smith, both of Syracuse, Ind., are president and manager respectively of the new company.

Glazier Stove Co., Chelsea, Mich., is arranging to enlarge its plant by the addition of two new buildings, each 3 stories high. Both buildings will be of brick and steel construction, equipped with latest improved machinery. One building will be used for gasoline stoves and the other for steel ranges. This company desires correspondence with manufacturers of equipment required.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

Phoenix, Ariz.—Heavy rains are reported to have destroyed the dam of Arizona Canal. Several railroad bridges were also damaged, including the washing out of 400 ft. of the bridge of the Maricopa & Phoenix & Salt River Valley R. R. (M. O. Bicknell, Supt., Phoenix) across Gila River.

Denver, Colo.—See "Power Plants, Gas and Electricity."

Washington, D. C.—See "Water."

Washington, D. C.—See "Power Plants, Gas and Electricity."

Washington, D. C.—A bill authorizing the District Comrs. to make contracts for not more than $1,800,000 for dredging the Eastern Branch of the Potomac and reclaiming the Anacostia flats has been introduced in the House.

Bids will be received until Jan. 5 by B. T. Galloway, Chmn. Bldg. Com., U. S. Dept. of Agriculture, Washington, for installing electric passenger elevators in 2 laboratory buildings at the U. S. Dept. of Agriculture, as advertised in The Engineering Record.

Key West, Fla.—The following are the bids opened on Dec. 2 by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for constructing a concrete quay wall at the naval station, Key West: Globe Constr. Co., 511 Old South Bldg., Boston, Mass., $225,000, according to plans and specifications, and Snare & Triest Co., 143 Liberty St., New York, N. Y., $166,000, with certain modifications and on its own plans.

Jacksonville, Fla.—Bids will be received until Jan. 8 by Maj. Francis R. Shunk, Corps. Engrs., U. S. A., for dredging at Orange Mills Flats, St. Johns River, Fla., as advertised in The Engineering Record.

**Onawa, Ia.*—The Canal Constr. Co., of Chicago, Ill., has secured the contract for excavating Cleghorn ditch (bids opened Nov. 6) at 10.9 cts. per cu. yd. for 125,000 cu. yds. black dirt. The other bidders were: Northern Constr. Co., Onawa, 11.85 cts. per cu. yd., and F. M. Crane, Little Sioux, 12.5 cts. per cu. yd. C. B. Ellis, Co. Aud.

New Orleans, La.—It is stated that bids will be received until Dec. 19 by the Bd. Comrs., Port of New Orleans, Hibernia Bank Bldg. (Hugh McCloskey, Pres.) for furnishing, treating and delivering piling and timber required for one year from date of contract. J. F. Coleman, Engr., Hibernia Bank Bldg.

**Baltimore, Md.*—The Baltimore & Ohio R. R. Co. is reported to have awarded to the McLean Constr. Co., of Baltimore, the contract for constructing a pier at Locust Point, 975 ft. long and 160 ft. wide, of double-deck construction, having two tracks for trains below and above; probable cost, $500,000.

Detroit, Mich.—Mayor Codd, the Municipal Art Comn., and the Board of Commerce, are reported to be in favor of constructing an elevated promenade along the river front.

Alexandria, Minn.—It is stated that bids will be received until Dec. 12 by E. P. Wright, Co. Aud., for constructing Ditch No. 8, aggregating 55,417 cu. yds.; probable cost, $6,531.

Two Harbors, Minn.—See "Railroads."

Glencoe, Minn.—It is stated that bids will be received until Jan. 12 by F. D. Stocking, Co. Aud., for constructing Ditch No. 13, aggregating 52,421 cu. yds.; probable cost, $4,718.

Owatonna, Minn.—Engineer Harvey T. Dartt, of Owatonna, writes that it is proposed to construct a ditch to drain Rice and Watkins Lakes, and several other lakes, at a probable cost of $100,000. About 1,000,000 cu. yds. of excav., 17 miles of main ditch and 20 miles of branches, will be constructed.

Ada, Minn.—Bids will be received until Jan. 3 by the Co. Comrs. for $3,500 bonds, the proceeds to be used to construct Waukon-Fossum Ditch No. 7. D. E. Fulton, Co. Aud.

Troy, N. Y.—See "Schools."

New York, N. Y.—Bids will be received until Dec. 15 by Maurice Featherson, Com. Docks, for furnishing material, delivering and putting in place about 20,000 cu. yds. of rip-rap stone, class 2.

New Brighton, S. I., N. Y.—Bids will be received until Dec. 19 (change of date) by Geo. Cromwell, Pres. Richmond Boro., at New Brighton, for furnishing and delivering broken stone and screenings in Stone Dists. Nos. 1 and 2, requiring in each, according to the Engineer's estimate, 400 cu. yds. 1½-in. stone, 800 cu. yds. ¾-in. stone and 300 cu. yds. screenings.

**Cincinnati, O.*—The contract for retaining walls on site of Cincinnati Hospital (bids opened Nov. 27) has been awarded to L. P. Hazen & Co., of Cincinnati, for $12,417.

Cleveland, O.—According to the programme outlined at a recent meeting of the Cuyahoga County Legislative delegation, it is proposed to improve the lake front of Cleveland, at a preliminary cost of $4,500,000 and an ultimate cost of over $30,000,000. In addition to this sum the government will expend $4,500,000 as its share of the expense. W. J. Carter, City Engr. Lieut. Col. Dan. C. Kingman, U. S. A., in charge of harbor improvements.

Philadelphia, Pa.—See "Paving and Roadmaking."

Philadelphia, Pa.—Bids will be received until Dec. 16 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for dredging and filling in at the reserve basin, Navy Yard, League Island, Pa., as per specification No. 1473; appropriation available, $77,000.

**Chattanooga, Tenn.*—Shippey & Outzen, of Memphis, are reported to have secured the contract for improving Tennessee River at Colbert and Bee Tree Shoals, for $243,811. Bids for this work were opened on Sept. 15 by Maj. H. C. Newcomer, Corps Engrs., U. S. A.

Austin, Tex.—Stone & Webster, 84 State St., Boston, Mass., are reported interested in rebuilding the granite dam across Colorado River, and it is said that active operations are expected the first of the new year.

Ft. Monroe, Va.—Bids will be received by Capt. E. E. Winslow, Corps Engrs., U. S. A., Norfolk, until Dec. 29, for constructing wharf at Ft. Monroe, as advertised in The Engineering Record.

Milwaukee, Wis.—An ordinance has been passed by Common Council, authorizing the issue of $80,000 park bonds.

Guantanamo, Cuba.—Bids will be received until Dec. 26, at the Bureau Supplies and Accounts, Navy Dept., Washington, D. C., to furnish at the Naval Station, Guantanamo Bay, Cuba, a quantity of yellow pine, windows, doors and frames, etc. H. T. B. Harris, Paymaster-Gen., U. S. N., Washington, D. C.

The only bid received and opened on Dec. 2, by the Bureau of Yards & Docks, Navy Dept., Washington, D. C., for constructing quay wall at the naval station, Guantanamo, was submitted by the Globe Constr. Co., Old South Bldg., Boston Mass., at $171,329, with modifications.

**Brooklyn, N. Y.*—The following are the bids opened on Nov. 15 by Martin W. Littleton, Pres. Brooklyn Boro., for furnishing material and constructing a flushing tunnel and intake and appurtenances, for the improvement of the sanitary condition of Gowanus Canal: (*a*) Borough Constr. Co., Brooklyn; (*b*) Jas. Malloy & Co., Brooklyn; (*c*) John Peirce Co., 277 B'way, N. Y. City (awarded contract):

	a	*b*	**c*
6,270 lin. ft. flushing tunnel	$135.00	$130.00	$100.00
8,200 cu. yds. additional brick mas'ry around flushing tunnel, built in tunnel construction	.01	.01	.01
4,100 cu. yds. additional concrete mas'ry around flush. tunnel, built in tunnel construction	.01	.01	.01
1,600 cu. yds. concrete masonry in and about intake and outfall	13.75	10.00	8.00
4,500 cu. yds. excav. in and about intake and outfall	4.30	1.00	.60
8,500 lin. ft. bearing piles	.23	.30	.30
1,250 lin. ft. fender piles	.40	.40	.65
113 M. ft. temporary sheet piling	.62	.50	.60
182 M ft. permanent sheet piling	.66	.50	.60
280 M. ft. foundation planking	.01	25.00	50.00
20 M. ft. pile capping	54.00	40.00	60.00
280 M. ft. sheeting and bracing	.01	30.00	50.00
900 lin. ft. 12-in. pipe sewer	.01	2.50	1.00
60 lin. ft. 15-in. pipe sewer	.01	2.50	1.67
560 lin. ft. 18-in. pipe sewer	.01	3.00	2.00
680 lin. ft. 24-in. pipe sewer	.01	4.50	3.00
20 lin. ft. 36-in. brick sewer	.01	5.00	6.00
20 lin. ft. 60-in. brick sewer	.01	15.00	12.00
20 manholes	.01	55.00	100.00
1,800 lin. ft. 6-in. house connection pipe drain	.01	.30	.60
264 sq. ft. bluestone coping	2.00	.50	.50
280 lin. ft. granite coping	11.00	10.00	5.00
6,400 lin. ft. 12-in. pipe sub-drain	.01	.01	.01
35 tons steel I-beams	60.00	80.00	100.00
6.5 tons wrought iron	279.00	75.00	100.00
33 tons cast iron	69.00	70.00	80.00
28.5 tons steel rods	62.00	80.00	100.00
5,000 cu. yds. dredging	1.88	.50	.75
Totals	$931,552	$892,026	$715,472

Lake Benton, Minn.—Bids will be received until Jan. 3 by the Co. Comrs. for $5,000 ditch bonds. R. H. Sisson, Co. Aud.

Kansas City, Mo.—E. E. Porterfield is attorney and Robt. C. Barnett is engineer for the syndicate that is promoting the construction of a tunnel and viaduct, from 15th St. and Baltimore Ave. west to Kansas City, Kan.

**Sylvan Beach, N. J.*—A sub-contract for furnishing the piling and cribbing timber for the barge canal docks at Sylvan Beach is reported to have been awarded to Duncan W. Peck, of Syracuse, for about $60,000.

**New Orleans, La.*—The following are the bids opened Nov. 27 by Capt. J. F. McIndoe, Corps Engrs., U. S. A., for dredging a channel near west shore of Sabine Lake, connecting Sabine and Neches Rivers with Taylors Bayou, and for constructing creosoted wooden revetment: (*a*) Southern Dredging Co., Mobile, Ala.; (*b*) Chas. C. Ely, Savannah, Ga.; (*c*) Atlantic, Gulf & Pacific Co., New York, N. Y.; (*d*) Bowers Southern Dredging Co., Galveston, Tex. (recommended for award); (*e*) North American Dredging Co., San Francisco, Cal.:

	a	*b*	*c*	**d*	*e*
2,923,000 cu. yds. dredging	$0.10½	$0.15	$0.0998	$0.08	$0.1474
5,200 lin. ft. creosoted wooden revetment	20.00	13.20	9.60	9.20	12.00
Time of completion	......	32 mos.	29 mos.	11 mos.	24 mos.
Totals	$410,915	$507,090	$341,635	$281,680	$493,250

PROPOSALS OPEN

For Proposals see pages 60, and 61.

WATER.

Bids Close.		See Eng. Record.
Dec. 13.	Pipe, etc., Vancouver, B. C.	Nov. 18
Dec. 13.	Mains, etc., Long Island City, L. I., N. Y.	Dec. 2
Dec. 13.	Mains, etc., New York, N. Y.	Dec. 2
Dec. 13.	Pipe, etc., Brooklyn, N. Y.	Dec. 2
Dec. 14.	**Sluice gates, etc., Richmond, Va.**	**Dec. 8**
Dec. 15.	Canal work, Huntley, Mont. Adv. Oct. 21 to Dec. 9.	Oct. 21
Dec. 15.	Steel water tank, Lovington, Ill.	Nov. 25
Dec. 15.	Well. Kirkwood, Ill.	Dec. 9
Dec. 15.	Water wks., Sleepy Eye, Minn.	Dec. 9
Dec. 18.	**Water wks., Abbeville, La.**	**Nov. 25**
Dec. 18.	Pump engine, Cleveland O. Adv. Dec. 2.	Dec. 2
Dec. 19.	Filtration plant, Troy, N. Y. Adv. Dec. 9.	Dec. 9
Dec. 20.	Tunnel, Milwaukee, Wis.	Dec. 9

---

* *Items marked thus give the names of parties awarded contracts.*

Dec. 20.	Water wks., Prescott, Wash.	Nov. 25
Dec. 20.	Pipe line, etc., San Diego, Cal.	Dec. 2
Dec. 20.	Water tower, Cleveland, O. Adv. Dec. 9.	Dec. 9
Dec. 21.	Mains, Muskogee, Ind. Ter. Adv. Dec. 2 to 9.	Dec. 2
Dec. 21.	C. i. pipe, Avalon, N. J.	Dec. 9
Dec. 21.	Engine, pumps, etc., Ft. Wayne, Ind. Adv. Dec. 9.	Dec. 9
Dec. 22.	Boilers, Chicago, Ill.	Dec. 9
Dec. 26.	Pipe, etc., Washington, D. C.	Dec. 9
Dec. 29.	**Canal, etc., Klamath Falls, Ore.** Adv. Nov. 4 to Dec. 9.	**Nov. 4**
Dec. 30.	Pumping engine, Washington, D. C. Adv. Dec. 2 to Dec. 9.	Dec. 2
Jan. 1.	**Irrig. work, El Campo, Tex.**	**Oct. 7**
Jan. 1.	Irrig. system, Encampment, Wyo.	Dec. 9
Jan. 2.	**Water wks., Manila, P. I.**	**Sep. 30**
Jan. 2.	Water wks, Shenandoah, Va.	Dec. 2
Jan. 15.	Irrig. canals, Huntley, Mont. Adv. Dec. 9.	Dec. 9
Jan. 15.	Pumping engine, Lincoln, Neb. Adv. Dec. 9.	Dec. 9
Feb. 1.	Water wks., Woodward, Okla. Ter.	Nov. 25
————	Franchise, Chattanooga, Tenn. Adv. Nov. 11.	Nov. 11
————	Pump, etc., Valdosta, Ga.	Dec. 2
————	Meters, Delphi, Ind.	Dec. 9

SEWERAGE AND SEWAGE DISPOSAL.

Dec. 11.	Syracuse, N. Y.	Dec. 2
Dec. 11.	Jersey City, N. J.	Dec. 9
Dec. 12.	Long Island City, L. I., N. Y.	Dec. 2
Dec. 12.	Cleveland, O.	Dec. 2
Dec. 13.	Brooklyn, N. Y.	Dec. 2
Dec. 13.	Columbus, O.	Dec. 9
Dec. 13.	Pittsburg, Pa.	Dec. 9
Dec. 14.	Cleveland, O.	Dec. 9
Dec. 15.	Buffalo, N. Y.	Dec. 9
Dec. 16.	Boston, Mass.	Nov. 25
Dec. 18.	Abbeville, La.	Nov. 25
Dec. 18.	Petersburg, Va.	Dec. 2
Dec. 18.	Ft. Oglethorpe, Ga.	Dec. 9
Dec. 18.	Kincardine, Ont.	Dec. 9
Dec. 19.	Independence, Kan. Adv. Nov. 18.	Nov. 18
Dec. 20.	Bristol, Pa. Adv. Nov. 18 to 25.	Nov. 18
Dec. 20.	South Bend, Ind. Adv. Dec. 9.	Dec. 9
Dec. 21.	Muskogee, Ind. Ter. Adv. Dec. 2 to 9.	Dec. 2
Dec. 22.	Cincinnati, O.	Dec. 2
Dec. 27.	Cincinnati, O.	Dec. 9
Dec. 30.	Waterbury, Conn.	Dec. 9
Dec. 30.	Ft. Assinniboine, Mont.	Dec. 9
Dec. —.	Rockport, Ind.	Nov. 11
Jan. 12.	**Manila, P. I.**	**Sep. 30**
Feb. 1.	**Woodlawn, Ala.**	**Oct. 28**
Feb. 1.	Libertyville, Ill.	Nov. 25
Feb. 15.	Princeton, Ind.	Nov. 25
Feb. —.	Lake Forest, Ill.	Nov. 25
Feb. —.	Highland Park, Ill.	Nov. 25

BRIDGES.

Dec. 9.	New York, N. Y.	Dec. 2
Dec. 12.	Madison, Neb.	Dec. 9
Dec. 14.	Canton, S. D.	Dec. 9
Dec. 14.	Edina, Mo., Adv. Dec. 9	Dec. 9
Dec. 15.	Milwaukee, Wis.	Nov. 25
Dec. 15.	Boston, Mass.	Dec. 9
Dec. 18.	Wilson, N. C.	Dec. 9
Dec. 18.	Manitowoc, Wis.	Dec. 9
Dec. 18.	Bradford, Pa.	Dec. 9
Dec. 19.	Cambridge, O.	Dec. 9
Dec. 20.	Knoxville, Tenn.	Dec. 9
Dec. 22.	Carlisle, Pa.	Dec. 9
Dec. 27.	Norristown, Pa.	Dec. 2
Jan. 1.	Pensacola, Fla.	Sep. 30
Jan. 2.	Helena, Mont.	Dec. 9
Jan. 2.	Zim, Minn.	Dec. 9
Jan. 4.	Salem, Mass.	Dec. 9
Jan. 4.	Gloucester, Mass.	Dec. 9
Jan. 9.	Chattanooga, Tenn. Adv. Dec. 9.	Dec. 9
Apr. 1.	West Fork, W. Va.	Dec. 2

PAVING AND ROADMAKING.

Dec. 11.	Knox, Ind.	Dec. 2
Dec. 11.	Syracuse, N. Y.	Dec. 2
Dec. 12.	Cincinnati, O.	Nov. 25
Dec. 12.	New York, N. Y.	Dec. 2
Dec. 12.	Long Island City, L. I., N. Y.	Oec. 2
Dec. 12.	Shelbyville, Ind.	Dec. 2
Dec. 12.	Philadelphia, Pa.	Dec. 9
Dec. 13.	Brooklyn, N. Y.	Dec. 2
Dec. 13.	Columbus, O.	Dec. 9
Dec. 13.	Pittsburg, Pa.	Dec. 9
Dec. 14.	Lakewood (P. O. Cleveland), O.	Dec. 9
Dec. 16.	Norwood, O.	Dec. 2
Dec. 18.	Kalamazoo, Mich.	Nov. 18
Dec. 18.	Sherman, Tex. Adv. Dec. 2	Dec. 2
Dec. 19.	Cincinnati, O.	Dec. 2
Dec. 21.	Buffalo, N. Y.	Dec. 9
Dec. 21.	Avalon, N. J.	Dec. 9
Dec. 27.	Montgomery, Ala.	Dec. 9
Dec. 28.	Little Rock, Ark.	Dec. 9
Jan. 2.	Helena, Mont.	Dec. 9

POWER PLANTS, GAS AND ELECTRICITY.

Dec. 12.	Washington, D. C.	Dec. 2
Dec. 13.	Central Islip, N. Y.	Dec. 9
Dec. 15.	Bowling Green, Mo.	Nov. 25
Dec. 18.	Gas plant, Winnipeg, Man. Adv. Nov. 18 to 25.	Nov. 18
Dec. 18.	Abbeville, La.	Nov. 25
Dec. 19.	Washington, D. C.	Dec. 9
Dec. 26.	Washington, D. C.	Dec. 2
Dec. 27.	Lockport, Ill.	Nov. 4
Dec. 28.	Rio Vista, Cal.	Dec. 9
Jan. 2.	Shenandoah, Va.	Dec. 2
Jan. 5.	Washington D. C. Adv. Dec 2 to 9.	Dec. 2
Jan. 15.	Cincinnati, O.	Dec. 2
————	Franchise, Chattanooga, Tenn. Adv. Nov. 11.	Nov. 11
————	Bamberg, S. C.	Dec. 2
Apr. —.	Oakesdale, Wash.	Nov. 25

BUILDINGS.

Dec. 11.	Pub. bldg., New York, N. Y.	Dec. 2
Dec. 11.	School, New York, N. Y.	Dec. 2
Dec. 12.	Court house, Fairmount, Minn.	Nov. 18
Dec. 12.	Court house, New York, N. Y.	Dec. 2
Dec. 13.	Plmbg. hospital, Utica, N. Y. Adv. Dec. 9.	Dec. 9
Dec. 13.	Plmbg. hospital, Buffalo, N. Y. Adv. Dec. 9.	Dec. 9
Dec. 13.	School, Gloversville, N. Y.	Dec. 9
Dec. 13.	School, Hasbrouck Heights, N. J.	Dec. 9
Dec. 14.	School, Humboldt, Tenn.	Nov. 11
Dec. 14.	Church, New Prague, Minn.	Nov. 18
Dec. 15.	Pub. bldg., Ft. Meade, S. D.	Nov. 25
Dec. 15.	Bank, Conway, S. C.	Nov. 25
Dec. 15.	Hotel, Beaumont, Tex.	Dec. 2
Dec. 15.	Pub. bldg., Milledgeville, Ga.	Dec. 9
Dec. 16.	Expo. bldg., Norfolk, Va. Adv. Dec. 9.	Dec. 9
Dec. 16.	School, Lincoln, Neb.	Dec. 9
Dec. 18.	Post bldgs., Ft. Leavenworth, Kan. Adv. Nov. 25 to Dec. 9.	Nov. 25
Dec. 18.	School, New York, N. Y.	Dec. 9
Dec. 18.	School, Flushing, L. I., N. Y.	Dec. 9
Dec.. 18.	Court house plans, Woodsfield, O.	Dec. 9
Dec. 20.	Pub. bldg., Annapolis, Md.	Nov. 18
Dec. 20.	School, Sanford, N. C.	Nov. 25
Dec. 20.	Pub. bldg., Washington, D. C. Adv. Dec. 2 to 9.	Dec. 2
Dec. 20.	School, Paris, Tex.	Dec. 9
Dec. 20.	Pub. bldg., Kansas City, Mo.	Dec. 9
Dec. 20.	Bath, Brooklyn, N. Y.	Dec. 9
Dec. 21.	Htg. Univ., Wilberforce, O.	Nov. 25
Dec. 21.	Arsenal, Philadelphia, Pa. Adv. Dec. 9.	Dec. 9
Dec. 22.	Hospital, Prescott, Ariz, Adv. Nov. 25 to Dec. 9.	Nov. 25
Dec. 22.	School improv., Toledo, O.	Dec. 2
Dec. 22.	Jail, Sparta, Tenn.	Dec. 9
Dec. 26.	Hospital, Ft. Wood, N. Y. Harbor	Dec. 9
Dec. 28.	Courthouse plans, Griffin, Ga.	Dec. 9
Dec. 28.	Htg. P. O., Battle Creek, Mich. Adv. Dec. 9.	Dec. 9
Dec. 29.	School. Marquette, Mich.	Nov. 18
Dec. 30.	Pub. bldgs., Ft. Assinniboine, Mont.	Dec. 9
Dec. —	**School, Bloomington, Ind.**	**Oct. 21**
Jan. 1.	**Hotel, Davenport, Ia.**	**Sep. 30**
Jan. 1.	Jail, etc., Lillington, N. C.	Nov. 25
Jan. 1.	Repairing court house, etc., Kentland, Ind.	Dec. 9
Jan. 2.	School, Riverside, Cal.	Dec. 2
Jan. 2.	Pub. bldg., Akron, O.	Dec. 9
Jan. 4.	Post Office, Natchitoches, La.	Nov. 18
Jan. 4.	Library for Univ., Bloomington, Ind. Adv. Nov. 25.	Nov. 25
Jan. 4.	School, Pawhuska, Okla. Ter.	Dec. 2
Jan. 5.	Htg. pub. bldg., Washington, D. C. Adv. Dec. 2 to 9.	Dec. 2
Jan. 8.	Court house, Hillsboro, N. D.	Nov. 25
Jan. 8.	Improv. at War College, Washington, D. C. Adv. Dec. 9.	Dec. 9
Jan. 10.	Library plans, Toronto, Ont.	Sep. 23
Jan. 10.	P. O. bldg., Reno, Nev. Adv. Nov. 18 to 25.	Nov. 18
Jan. 15.	School plans, Newark, N. J.	Dec. 9
Jan. 15.	School plans, Dallas, Tex.	Dec. 9
Jan. —	**Hotel annex, Louisville, Ky.**	**Nov. 4**
Jan. —.	Htg. college, Medford, Mass.	Dec. 2
Feb. 1.	Plans for armory, Hartford. Conn.	Nov. 18
Feb. —.	Hospital, Indianapolis, Ind.	Nov. 25
————	School, Chemawa, Ore.	Nov. 25
————	School Plans, Augusta, Ga.	Nov. 25

MISCELLANEOUS.

Dec. 11.	Dredging, New York, N. Y. Adv. Nov. 25 to Dec. 9.	Nov. 25
Dec. 12.	Dam, Wheeling, W. Va. Adv. Nov. 11 to Dec. 2.	Nov. 11
Dec. 12.	Supplies, Washington, D. C.	Dec. 2
Dec. 12.	Ditch, etc., Houston, Tex.	Dec. 2
Dec. 12.	Ditch. Alexandria, Minn.	Dec. 9
Dec. 12.	Supplies, Philadelphia, Pa.	Dec. 9
Dec. 12.	R. R. work, Brooklyn, N. Y.	Dec. 9
Dec. 13.	Garb. disp., York, Pa.	Dec. 9
Dec. 15.	Telephone system, Huntley, Mont. Nov. 4 to Dec. 9.	Nov. 4
Dec. 15.	**R. R. franchise, Manila, P. I.**	**Nov. 4**
Dec. 15.	Rip-rap, New York, N. Y.	Dec. 9
Dec. 16.	Dredging, Philadelphia, Pa.	Dec. 9
Dec. 18.	Wickets for dams, Pittsburg, Pa. Adv. Nov. 25 to Dec. 9.	Nov. 25
Dec. 18.	Metal work, Philadelphia, Pa. Adv. Nov. 25 to Dec. 2.	Nov. 25
Dec. 18.	Steam pumps, etc., Panama Adv. Dec. 2 to 9.	Dec. 2
Dec. 19.	Timber, New Orleans, La.	Dec. 9
Dec. 19.	Supplies, Washington, D. C.	Dec. 9
Dec. 19.	Supplies, San Francisco, Cal.	Nov. 18
Dec. 19.	Broken stone, New Brighton, S. I, N. Y.	Dec. 9
Dec. 22.	Dredging, Richmond, Va. Adv. Dec. 2 to 9.	Nov. 25
Dec. 26.	Supplies, Washington, D. C.	Dec. 2
Dec. 26.	Supplies, Washington, D. C.	Dec. 9
Dec. 26.	Pine, etc., Guantanamo, Cuba	Dec. 9
Dec. 29.	Wharf, Ft. Monroe, Va. Adv. Dec. 9.	Dec. 9
Jan. 1.	Statue plans, Indianapolis, Ind.	Jul. 22
Jan. 1.	R. R. work, Dubuque, Ia.	Nov. 11
Jan. 2.	R. R. work, Santiago, Chili	Nov. 25
Jan. 4.	Garbage plant, Lexington, Ky. Adv. Dec. 0.	Dec. 9
Jan. 5.	Elevators, Washington, D. C. Adv. Dec. 9.	Dec. 9
Jan. 8.	Dredging, Jacksonville, Fla. Adv. Dec. 9.	Dec. 9
Jan. 9.	**Wharf, etc., Auckland, N. Z.** Adv. Oct. 14 to Dec. 9.	**Oct. 14**
Jan. 9.	**Jetty work, etc., Auckland, N. Z.** Nov. 4 to Dec. 9.	**Nov. 4**
Jan. 12.	Ditch, Glencoe, Minn.	Dec. 9
Jan. 15.	Excav. work, Buffalo, N. Y. Adv. Dec. 2.	Dec. 2
Apr. 2.	'06. Harbor Work, Valparaiso, Chili **Adv. Apr. 29 to Sep. 9.** Adv. Oct. 28 to Nov. 18.	Apr. 29
————	Fire alarm system. Seaforth, Ont.	Nov. 25
————	**Dredging, Nyack, N. Y.**	**Nov. 25**
————	**Ditch work, Pomona, Ill.** Adv. Nov. 25. Adv. Nov. 25 to Dec. 2.	**Oct. 28**
————	Grading, Beaumont, Tex.	Dec. 2

PROPOSALS.

To Builders of Water Works, Filtration Works, Pumping Plant, Stand Pipes and Pipe Laying

Board of Contract and Supply, Troy, N. Y., Dec. 5, 1905.—Sealed proposals for building a municipal water filtration plant, with auxiliary pumping plant, and two stand pipes, also laying water mains to connect the present works with the filter plant, pumping plant and stand pipes, the duplication of stream crossings on the Tomhannock pipe line, and all necessary appurtenances, all in accordance with the plans and specifications, will be received by the Board of Contract and Supply of the City of Troy, New York, until twelve o'clock noon of Tuesday, the nineteenth day of December, 1905.

Plans, specifications, proposal blank, forms of contract and other information can be obtained at the office of the Commissioner of Public Works, City Hall, Troy, N. Y. Prospective bidders can obtain information which will assist them in preparing their bids if desired at the same office.

Each bidder will be required to deposit a properly certified check for an amount equal to 5 per cent. of the total amount of his bid, made payable to the Treasurer of the City of Troy. This check will be returned to the unsuccessful bidder immediately after the awarding of the contract, and the check of the successful bidder will be returned upon the execution of the contract and the furnishing of the required bond, provided the bond is furnished and the contract executed within five days after the award is made.

A bond in the full sum of the amount of the contract with satisfactory sureties, will be required for the faithful performance of the work.

The work will be divided into six contracts as follows:

Contract No. 1—Excavating and grading of filter site.

Contract No. 2—Pipe laying.

Contract No. 3—Stand pipes.

Contract No. 4—Pumping plant.

Contract No. 5—Filter plant.

Contract No. 6—Duplication of stream crossings on Tomhannock pipe line.

Bidders may submit proposals upon one or all of the contracts, but the proposal must name a price for every item included in the contract or contracts bid upon.

The right is reserved by the Board of Contract and Supply to reject any and all bids if they deem it to the best interest of the city so to do.

By order of the board.

(Signed) JAMES M. RILEY,
Clerk.

U. S. ENGINEER OFFICE, WASHINGton Barracks, D. C. Sealed proposals will be received at this office until noon, January 8, 1906, and then publicly opened for Millwork, Glass and Glazing for Army War College Building. Information on application. JOHN STEPHEN SEWELL, Capt. Engrs.

U. S. ENGINEER OFFICE, JACKSONville, Fla., Dec. 8, 1905. Sealed proposals for dredging at Orange Mills Flats, St. Johns River, Fla., will be received here until 12 o'clock noon, Jan. 8, 1906, and then publicly opened. Information on application. FRANCIS R. SHUNK, Maj., Engrs.

TREASURY DEPARTMENT, OFFICE OF the Supervising Architect, Washington, D. C., December 6, 1905.—Sealed proposals will be received at this office until 3 o'clock P. M. on the 28th day of December, 1905, and then opened, for the low pressure steam heating apparatus complete in place in the U. S. Post Office at Battle Creek, Michigan, in accordance with the drawings and specification, copies of which may be had at this office or at the office of the Superintendent at Battle Creek, Michigan, at the discretion of the Supervising Architect. JAMES KNOX TAYLOR, Supervising Architect.

OFFICE OF THE BUILDING COMMITTEE, U. S. Department of Agriculture, Washington, D. C., December 8, 1905. Sealed proposals will be received at this office until 2 o'clock P. M. on the 5th day of January, 1906, and then opened, for the installation of electric passenger elevators of two laboratory buildings for the United States Department of Agriculture, Washington, D. C., in accordance with the drawings and specifications, copies of which may be obtained at the Office of the Building Committee, United States Department of Agriculture. All applications must be accompanied by a certified check for $50, made payable to the Disbursing Clerk of the Department of Agriculture, which checks will be retained until the return of the drawings and specifications. B. T. GALLOWAY, Chairman.

Additional Proposal Advertisements are printed on pages 55, 56, 60 and 61